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Flight-Lieut. J. I. T. Jones.*

THE GRAND STRATEGY OF ALEXANDER THE GREAT

ARTICLE I

BY MAJOR-GENERAL J. F. C. FULLER.

INTRODUCTION.

IN the April and July numbers of THE ROYAL AIR FORCE QUARTERLY appeared an article of mine under the title of "An Outline of the Grand Strategy of the World War." Since its publication I have received several letters concerning it, and in one the writer asked for further information. To condense his words, he said: If there is such a science, or art, as grand strategy, where can I find more information about it, what books should I read, and are there any which explain this subject historically? Though my reading of military history has been considerable, I was compelled to answer in the negative. There are, I said, a large number of books, such as Clausewitz's "On War," General Ross's "Representative Government and War," and General von der Goltz's "A Nation in Arms," all of which deal with grand strategy, and more or less examine the relationships of policy and war, yet I know of no book which can be considered a text-book on this subject; that is, a book showing how all the forces of a nation can be brought to focus in a war plan and utilized during a war so as to establish at its termination a better state of peacefulness than that which gave rise to the war.

Thinking over this question, it struck me as being extraordinary that this was so. Books on strategy, tactics and administration abound, yet no single book that I know of deals with the relationships of these three divisions of war, as they are represented in the defence forces, to national and not merely political power. Every war must have a grand strategical base of some sort—a base of sand or a base of rock. You cannot build a house on air, and yet unless the fighting man and the politician know something of the principles and object of grand strategy, are not they apt to build strategical and tactical castles in the clouds? To my young inquirer, for the officer in question was a Captain, I frankly had to confess that we sometimes used the word Abracadabra, and sometimes grand strategy, that both were more or less blessed words like Mesopotamia, and as regards text-books there

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was one, so I believed, on Abracadabra, but that grand strategy was not so fortunate.

Though my "Outline of the Grand Strategy of the World War" was sketchy, as perforce it had to be, I think it was sufficiently detailed to show the importance of this subject. Had we, as an Empire, possessed before the outbreak of the war a grand strategical brain, we could not possibly have made the blunders we did; and if before another war breaks out we do not create one there is no option but that of repeating these blunders, or others very similar to them. Grand strategy is, therefore, a subject of importance, especially to us as an Empire, in which variety and not uniformity is the predominant characteristic.

As time forbids that I attempt to write a text-book on grand strategy, which would take years of study and research, it may, nevertheless, be of some assistance to those who are interested to pass this subject in brief review, and then to select a simple yet clear example of what grand strategy involves.

For instance, take the Austro-Prussian War of 1866 and the Franco-Prussian War of 1870-71. The object of the first was to replace Austrian leadership over the German Federation of States by Prussian leadership; of the second to consolidate the German Empire. In the first, grand strategy was pivoted on toleration towards Austria. After the Battle of Königgrätz the Prussian General Staff wanted to occupy Vienna, but Bismarck objected, saying: "My chief concern was to avoid anything that would impair our future relationship with Austria, anything that would give rise to mortifying memories. . . . The victorious entry of the Prussian Army would, like any cession of anciently held dominions, have been a terrible blow to Austrian pride." This was sound policy, for the ethical object of the war*—a more perfect peace—was consequently established. In the Franco-Prussian War the reverse happened, the political object, that is the consolidation of the German Empire, being adulterated with the strategical object, the strengthening of Germany's western frontier by annexing Alsace and part of Lorraine, and the economic object, the possession of certain Lorraine ironfields. What was the result? Though the Empire was consolidated, France was humiliated; further, the occupation of Alsace-Lorraine established a bone of contention which was likely to cause another war; consequently the peace following the Franco-Prussian War was an unhealthy one.

I will turn now to the American Civil War, which for us is more important, as it includes sea power. The grand strategy of this war I

* To those interested, the various objects in war are examined in my book, "The Foundations of the Science of War."

have briefly examined in my book, "The Generalship of Ulysses S. Grant," to which the reader can turn if he wishes. All I will say here is that had its grand strategy been closely examined by us before the outbreak of the World War we could not have made the mistakes we did. Further, we should not now be wallowing in a so-called peace which, though every effort is being made to abolish war and restrict armaments, can never be ameliorated until the grand strategy which lurks behind every clause of the treaty of Versailles is reversed. Our present peace is, in fact, only a truce between two wars.

The Napoleonic Wars, the Seven Years' War, and the Thirty Years' War team with grand strategical lessons, as do also the Hundred Years' War, the Crusades, the Roman wars of expansion, and the Hannibalic wars; but in none of these do we find so clear-cut an example of the various objects in grand strategy as in Alexander the Great's wars, and in some ways none so modern, for they embraced every type of war, every form, and their aim was definitely to establish a more perfect peace in the form of a world federation. I will, therefore, take these wars as my example, and see what grand strategical lessons we can learn from them.

I. THE OBJECT OF ALEXANDER'S CONQUESTS.

Philip had found Macedon a country of ill-armed shepherds, and he left it the unquestioned head of the Grecian States. On this solid foundation did his son Alexander found his conquests.

In examining the campaigns of Alexander, we are apt to lose sight of his grand strategy in the brilliance of his astonishing battles. Yet, as a statesman, quite as much as a soldier, he demands our study, and if we do not realize this, not only do his campaigns lose the greater part of their interest, but they appear as objectless acts of destruction.

From earliest childhood his mind was aflame with one great ideal—love of his country. If his father had raised Macedon to a supreme position in Greece, he, in his turn, would make her mistress of the world, and not a mere sterile tyrant but a productive world force. To accomplish this immense task, conquests in themselves could only be looked upon as a means towards an end, which to Alexander was the hegemony of the known world. To establish this world rule, he saw quite clearly that his object could only be accomplished by gaining four objectives: the first was military security, the second was the fusion of races into one nation; the third was social contentedness, and the fourth commercial prosperity.

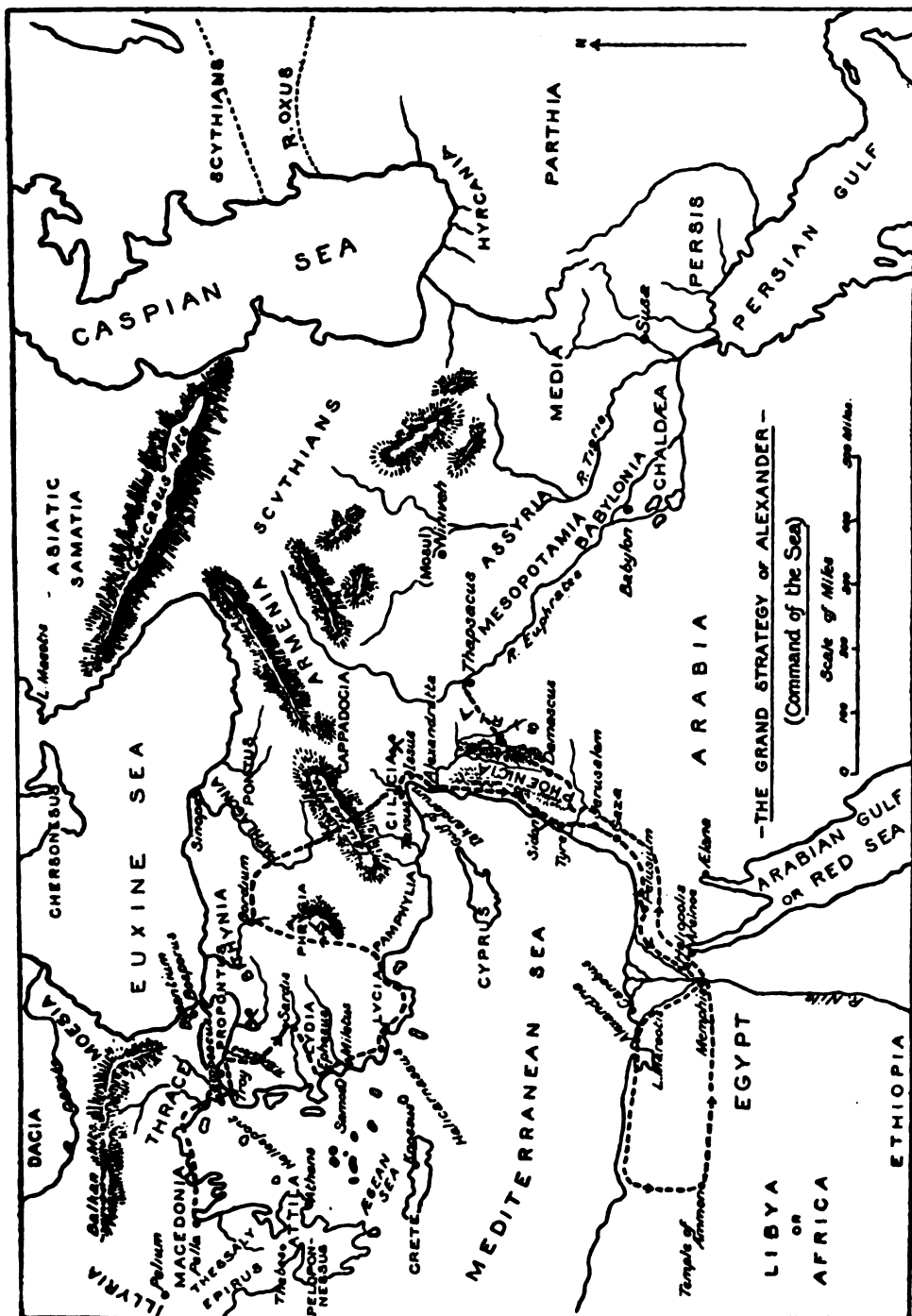
Military security first of all demanded the establishment of a solid base at home; secondly, the overthrow of Persian rule in Asia; and

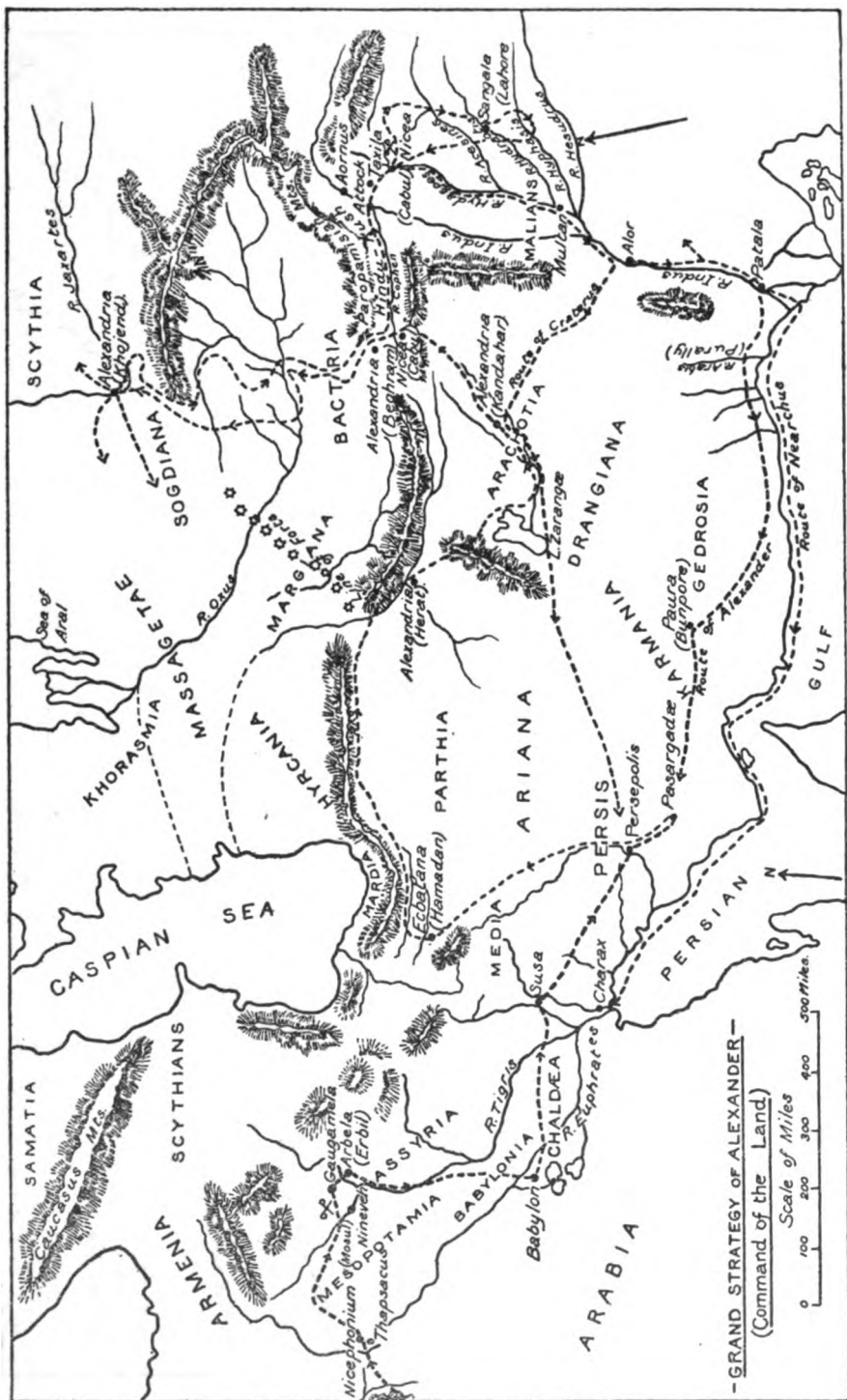
thirdly, the establishment of secure frontiers, not only of Greece herself, but as far as the arm of man could reach, so that eventually no other nation might be left in the world which could threaten Grecian rule. When, after the battle of Issus, Darius pleaded for his friendship and suggested that the great Macedonian should enter into alliance with him, Alexander scorned this proposal, and answered: "Come to me, therefore, since I am lord of all Asia." No half measure could tempt him to abandon his political objective, which was the replacement of Persian rule by that of Greece. No difficulty, outside the utter exhaustion of his army, could dissuade him from his military objective, which was to extend his kingdom until an unattackable frontier was established, such as the sea, or an impassable mountain range or desert. Bitter was his disappointment, as we shall see, when on reaching the Hyphasis (Sutlej) his army refused to go further, for this river in no way fulfilled the conditions of his ideal frontier, which he could only have found had he continued his advance to the mouth of the Ganges.

The establishment of this military security was but the first step in his tremendous project. He understood better than any other man in history the power of the sword. It could instil fear, and respect based on fear, but it could not instil contentedness and affection—it could sever, but it could not weld.

Alexander, though he sacked Tyre and Gaza and butchered thousands who opposed him, seldom, if ever, slaughtered his enemies wantonly; he had always a purpose behind these seemingly brutal acts, namely, to terrorize those of weak heart into submission, and to show those who might be thinking of opposing him that it would be as well if they did not do so. To those who submitted, he was magnanimous in the extreme, whether they were Persians, Scythians or Indians. The civil authorities he left in power, but the military control of the conquered lands he placed in the hands of his soldiers. Many of his enemies became his close friends, a notable example being Porus, the Indian king. Arrian, in his "Anabasis," gives us the following story:—

"Then indeed Alexander was the first to speak, bidding him say what treatment he would like to receive . . . Porus replied: 'Treat me, O Alexander, in a kingly way!' Alexander, being pleased at the expression, said: 'For my own sake, O Porus, thou shalt be thus treated; but for thy own sake, do thou demand what is pleasing to thee?' But Porus said that everything was included in that. Alexander, being still more pleased at this remark, not only granted him the rule over his own Indians, but also added another country to that which he had before, of larger extent than the former. Thus he





treated the brave man in a kingly way, and from that time found him faithful in all things.”*

Quite possibly Alexander’s vanity was flattered by the reply of Porus, but this in no way detracts from his wonderful power of appreciating the value of the ethical objective in war. Though he conquered the will of his enemies by the sword, he knew full well that it was only through the heart that men could be ruled, and he never left a stone unturned to win over his adversaries by acts of chivalry.

The turning of enemies into friends was not the limit of his genius. With his death his friends would vanish; he determined, therefore, to weld his mighty empire into one consolidated whole. His dream was both impossible and stupendous. What Rome accomplished in two centuries, Alexander attempted to gain in a span of a man’s life, and he died at the age of thirty-two. His dream was to overcome the differences of nationality, to fuse together the Occident and the Orient, and to produce a homogeneous race of men by inter-marriage and exchange of populations. He built cities not only for purposes of strategy and trade, but so that they might become Hellenizing centres from which a common culture might spread. He established, in the face of fierce opposition, equal rights and privileges between Greeks and Orientals, so that laws common to all would amalgamate all. Towards the end of his tremendous career he worked out schemes to colonize the Persian Gulf and the Black Sea, and Diodorus† tells us that, at the time of his death, Craterus, one of his most noted generals, who was then homeward bound, “had with him a paper of written instructions, among which were projects for building an immense fleet in Phœnicia and the adjacent countries, for conveying an expedition against the Carthaginians and the other western nations as far as the pillars of Hercules; for the erection of magnificent temples, and for the transportation of people from Europe into Asia, and from Asia into Europe.” His death put an end to this dream, for his generals set these projects aside “as too vast for anyone but Alexander himself.” Had he lived sixty-four years in place of thirty-two, what might he not have accomplished?

This fusion of races, Alexander saw full well, could not be attained by military force, or by the establishment of common rights, but by wealth begotten of commercial prosperity. His economic vision has never been equalled. He understood the value of the land and the value of the sea. On the former he established great trade centres, cities such as Alexandria, Alexandretta, Herat (Alexandria Areia),

* “The Anabasis of Alexander,” Arrian, V, XIX.

† Diodorus, XVIII, 4.

Khojend, Beghram (25 miles N.E. of Kabul) and Kandahar, and organized protected trade routes; on the latter he planned voyages to all known parts of the world. The voyage of Nearchus from the Indus to the Euphrates, seeing that he carried with him an entire army into unknown seas, is one of the more daring exploits in the history of the sea. It confirmed Alexander's opinion as to the immense possibilities of maritime trade. He thereupon planned a voyage of discovery "round the whole Arabian peninsula as far as the Arabian Gulf (Red Sea) near Egypt."* At Babylon he planned a harbour and dockyard for one thousand vessels. He meditated "a voyage round the larger portion of Arabia, the country of the Ethiopians, Libya (Africa), and Numidia beyond Mount Atlas to Gadeira (Cadiz), inward into our sea (the Mediterranean); thinking that after he had subdued both Libya and Carthage, then indeed he might with justice be called king of all Asia Some say that he was meditating a voyage thence into the Euxine Sea, to Scythia and the lake Mæotis (the sea of Azov), while others assert that he intended to go to Sicily and the Iapygian Cape (Capo di Leuca) for the fame of the Romans spreading far and wide was now exciting his jealousy."†

His commercial sense was as wonderful as his statecraft, and his statecraft as astonishing as his strategy, and his strategy as audacious as his tactics. All these things we must understand if we would gather knowledge from the campaigns of Alexander. They were not the ferocious incursions of a war genius, but the meditated acts of a world genius, who understood war as a means, and who had an end in view—a strong, prosperous, contented and federated world. True, this was an impossible ideal, but it only adds to our wonder that one man conceived it. Impossible, in the days of Alexander, demi-god though he was, the world was not ready for so high a dispensation; the world is not ready yet, but still mankind is searching for this perhaps not altogether unattainable Utopia.

2. THE ESTABLISHMENT OF DOMESTIC SECURITY.

Gripped by this stupendous ideal, surely one of the most gigantic conceived by a single brain, Alexander was level-headed enough to realize that, until he had consolidated his position at home, it must remain but a dream, or else, like a will-o'-the-wisp, lead him to destruction in Asia.

At home two difficulties confronted him; disorder, due to the assassination of Philip, and the insecurity of his northern frontier. Of these he considered the first to be the most pressing; consequently, in

* "The Anabasis of Alexander," Arrian, VII, XX.

† "The Anabasis of Alexander," Arrian, VII, II.

336 B.C., in his twentieth year, this extraordinary youth marched into Thessaly and, having re-established order in this country, the following year he marched into Thrace and thence northwards to the Danube and conquered the barbarians who inhabited Dacia (Transylvania).

Though he crossed the Danube, to the Greeks known as the Ister, he realized that it and the Balkans formed so strong a natural frontier that it would be waste of time to proceed further north. Having established his posts, he turned southwards and soon learnt of the revolt of the Illyrians under Clitus and Glaucias. Consequently he headed straight for Pelium, besieged this city, and defeated the rebels. His absence in Illyria (Serbia) had given rise to rumours that his army had perished in the mountains; this false news coupled with the intrigues and gold of Darius, the Persian king, resulted in a serious revolt of the Thebans, who now seized the opportunity to throw off the Macedonian yoke. Many other states sympathized with this rebellion.

Alexander determined for once and for all to establish order. Setting out from Pelium, he marched on Thebes with such speed that he had crossed the pass of Thermopylæ before the Thebans were aware of his approach. Thebes he besieged and took by storm, and with the exception of the house of Pindar the poet, he razed the city to the ground and its inhabitants he sold into slavery.*

This swift and tragic blow stunned the rebels. The Athenians, who were on the point of assisting Thebes, withdrew their support. The Spartans were paralysed, and the Ætolians and the Elæns hastened to send ambassadors to Alexander to crave forgiveness. Such was the moral effect of the destruction of Thebes, the proud city of Epaminondas, victor of Leuctra and of Mantinæa, that, during the twelve years' absence of Alexander in Asia, his home base remained secure. Many historians have decried this seemingly brutal act of destruction, and though there is every reason to suppose that, had the Thebans surrendered unconditionally, Alexander would have spared the city, the fact remains that its destruction did establish domestic tranquillity among a congeries of States which for centuries had been cutting each other's throats. Rather than as an act of vengeance should we look upon it as a surgical operation which, at least for a period, excised the cancer of revolt from the body of a unified Greece. Without stability of peace at home there could be no conquest abroad, and Thebes was the burnt offering to Alexander's tremendous project.

3. THE ESTABLISHMENT OF A MILITARY BASE.

Having established a firm base at home, his next step was to establish a military base in western Asia Minor. To understand the campaigns

* "It is said that Alexander preserved the house of Pindar the poet, out of respect for his memory" (Arrian I, X).

which I shall now enter on, it is first of all necessary to realize the internal conditions of the Persian Empire. In extent it was immense, at least thirty times as large as Greece. It was composed of many kingdoms and races which, though they were governed by Darius, as a whole were lacking in stability. The people were heavily taxed by the numerous satraps who squandered vast sums of public money on their own enjoyments. They cared little who ruled them as long as they were left alone; lack of a just and friendly government had destroyed their national spirit, and had rendered any form of patriotism impossible. Alexander was well acquainted with these conditions, for throughout his career he never missed an opportunity of gathering information. He had learnt much from Xenophon, and he realized that as long as his own people remained tranquil, his grand strategy must be based not so much on attempting to conquer the Persian kingdoms and provinces as on delivering them from the Government of the corrupt Persian monarchy, therefore he came as their deliverer. To accomplish this end he must utterly destroy Persian military power, and we shall see that not only did he accomplish this, but whilst to friendly provinces he showed the greatest consideration, to hostile ones he could at times be ruthless in the extreme. The secret of his success, short lived though it was, was quite as much due to his statesmanship as to his generalship.

In the military organization of Philip of Macedon, the control of the army, though ultimately impinging on himself, was divided between what to-day might be called a civil and a military commander-in-chief. Antipater held the first of these appointments, and Parmenio the second. Leaving Antipater in Greece with 12,000 foot and 1,500 horse, Alexander, in the spring of 334 B.C., set out at the head of 30,000 infantry and 5,000 cavalry along the northern shores of the Ægean Sea to the Hellespont. Having crossed over to Troy, he visited the tomb of his mythical ancestor Achilles. Thence he turned northwards, and marching by Lampsacus and Priapus met the Persians on the river Granicus and decisively defeated them. His actions following this battle give us the clue to his whole policy. He at once marched on Sardis, the capital of Lydia, because it was the political and financial centre of western Asia Minor. Mithrines, the governor, opened the city gates, and was immediately rewarded by Alexander for doing so. The city was granted its freedom and the old Lydian laws and privileges were re-established; this at once won over the people who hailed Alexander as their deliverer.

From Sardis he marched to Ephesus, "where he recalled from exile all the men who had been banished from the city on account of their adherence to him; and having broken up the oligarchy, he established a democratical form of government there." This so pleased the

Ephesians that they set to work to kill off their former rulers. "But Alexander prevented them making any further quest of the rest of the oligarchs for the purpose of wreaking their vengeance upon them; for he knew that if the people were not checked, they would kill the innocent along with the guilty, some from hatred, and others for the sake of seizing their property. At this time Alexander gained great popularity both by his general course of action, and especially by what he did at Ephesus."*

From Ephesus he visited a number of cities and carried out a variety of public works and improvements in commemoration of their liberation from Persian rule, and as Colonel Dodge says: "He thus made firm his hold on the territory he conquered, not only by the best measures for military occupation, but by fostering political goodwill in the cities."† This political insight is the keystone of the whole of Alexander's grand strategy, and without gaining his social objective by ethical means his military object must have remained an impossible dream.

4. THE CONTROL OF THE SEA.

In the autumn of 334 B.C., Alexander marched to Miletus, the most important Persian naval base on the Ægean, situated a few miles south-east of the island of Samos. The reason for this move introduces to us the next step in Alexander's plan.

At the battle of Granicus, Darius had sustained a severe blow in a distant quarter of his empire. He still had, however, immense military resources at his disposal, and further his fleet held command of the Ægean. Alexander no longer feared his army, but he dared not leave his fleet at liberty to foment trouble in Greece by the normal Persian method—bribery. He had but 160 ships; these he sent to Miletus, but shortly after their arrival a Persian fleet of about 400 vessels appeared opposite the harbour. Parmenio advised Alexander to fight a sea battle, but Alexander refused to do so, as he considered that "it would be rash for him with a few ships to fight a battle against a fleet far more numerous than his own"‡ Further, if he were beaten the loss of prestige resulting might lead to a revolution in Greece.

Instead of striking at the Persian ships at sea, he determined to strike at their sea bases—their harbours and ports. For this purpose his fleet would be of little use, so he laid up his ships and paid off his seamen; if the fleet could not defeat the Persian fleet it was no use to him; but the men were, and he soon turned them into soldiers. Miletus was

* "The Anabasis of Alexander," Arrian, I, XVII.

† "Alexander," T. A. Dodge, Vol. I, p. 256.

‡ Arrian, I, XVIII.

stormed and taken, whereupon Alexander proceeded to the next Persian port—Halicarnassus—which was stormed and destroyed.

With the fall of Halicarnassus the Persian fleet was deprived of its last base in the Ægean, but as it could still seek supplies and refit in the various ports along the southern coast of Asia Minor, Alexander “marched towards Lycia and Pamphylia, in order to gain command of the coast-land, and by that means render the enemy’s fleet useless.”* One cannot but admire not only Alexander’s audacity, but his grasp of naval strategy. Little, by little, by depriving it of its bases, he drove the Persian fleet eastwards, and he did this so thoroughly that, by the autumn of 333 B.C., the whole of the coast-line from Cicilia (Taurus Mountains) to the Hellespont was in his hands.

Darius, having thus been deprived of all power to foment rebellion in Greece, began to stir himself; he raised an immense army to throw back the invader, and was decisively beaten at the battle of Issus. Meanwhile the enormous treasure which fell into Alexander’s hands enabled him to build a powerful fleet; this, he did, and further still he hoped to man it with Phœnician seamen, who were the most expert sailors of his day.

After the victory of Issus his controlling idea is still a naval one. Having gained the coast-line as far as Alexandretta, he determined to proceed down the Syrian coast to Gaza, and thence to Egypt. I will give his own words as quoted by Arrian:—

“Friends and allies, I see that an expedition to Egypt will not be safe for us, so long as the Persians retain the sovereignty of the sea; nor is it a safe course, both for other reasons, and especially looking at the state of matters in Greece, for us to pursue Darius, leaving in our rear the city of Tyre itself in doubtful allegiance, and Egypt and Cyprus in the occupation of the Persians. I am apprehensive lest, while we advance with our forces towards Babylon and in pursuit of Darius, the Persians should again forsooth conquer the maritime districts, and transfer the war into Greece with a large army, considering that the Lacedæmonians are now waging war against us without disguise,† and the city of Athens is restrained for the present rather by fear than by any goodwill towards us. But if Tyre were captured, the whole of Phœnicia would be in our possession, and the fleet of the Phœnicians, which is the most numerous and the best in the Persian navy, would in all probability come over to us. For the Phœnician sailors and mariners will not dare to put to sea in order to incur danger on behalf of others, when their own cities are occupied by us. After this, Cyprus will either yield to us without delay, or will be captured with ease at the mere arrival of a naval force; and then navigating the sea with the

* *Ibid.* I, XXIV.

† This revolt was put down by Antipater.

ships from Macedonia in conjunction with those of the Phœnicians, Cyprus also having come over to us, we shall acquire the absolute sovereignty of the sea, and at the same time an expedition into Egypt will become an easy matter for us. After we have brought Egypt into subjection, no anxiety about Greece and our own land will any longer remain, and we shall be able to undertake the expedition to Babylon with safety in regard to affairs at home, and at the same time with greater reputation in consequence of having appropriated to ourselves all the maritime provinces of the Persians, and all the land this side of the Euphrates.'''*

I make no apology for this long quotation, for, far better than any comment I could offer, does it reveal to us the grand strategy of Alexander. His military objective is Babylon, but he cannot advance on Babylon unless his home base is secured. To gain this security he must utterly destroy Persian naval supremacy. He has now built a fleet which will assist him to do so, but to obtain the greatest power out of his ships he must also command the whole of the coast-line to the Nile. If he can hold this coast-line, not only will the Persian fleet be wiped off the seas, but the Phœnicians and Cyprians will be compelled to join him, and when their fleets are added to his own, not only will he have gained complete naval but complete mercantile supremacy. Further still, he will have established a second line of communication with his home base, and so can obviate, if necessary, the difficulty of the land route, should any of the former Persian states revolt against him.

To gain this dual command of the eastern Mediterranean, it was essential that he should occupy Tyre and the mouth of the Nile. Tyre would give him naval power, and by holding the Nile delta he would be able to divert the wealth of Egypt to Greece. From this it will be seen that, whilst he maintained the military objective, Alexander never forgot the economic objective. Though he enjoyed war more than most men, to him war was not an end in itself, but a means towards an end—the security and economic prosperity of Greece. With a well-supplied base, once he had gained command of the sea, then all that remained between him and his final object—the hegemony of the known world—was a series of land campaigns.

The siege of Tyre constituted one of the toughest operations ever undertaken by the great Macedonian. Ultimately it was stormed and razed to the ground, not as a mere act of vengeance, but to strike terror into the hearts of the remaining coastal towns, for no man knew better than Alexander when, and when not, to attack his enemy's nerves and the nerves of semi-neutral states.

* *Ibid.* II, XVII.

5. THE GAINING OF THE ECONOMIC OBJECTIVE.

The capture of Tyre virtually placed the command of the eastern Mediterranean in the hands of Alexander. All that now remained for him to do, before he turned on Darius, was to gain his economic objective in Egypt.

In 331 B.C. he marched *via* Jerusalem* to Gaza, which, after a two months' siege, he took by storm. From Gaza, after a seven days' march across the desert, he arrived at Pelusium† in Egypt, his fleet coasting along from Phœnicia. From here he sailed up the Nile to Memphis, crossed the desert to Heliopolis, returned to Memphis, and then sailed to Canobus (Aboukir), some thirteen miles from which he disembarked. Seeing that the position was likely to be a prosperous one, he founded Alexandria. His commercial foresight was as acute as his military, for Alexandria to-day still stands a monument to his prevision.

From Alexandria he proceeded to the temple of Jupiter Ammon, which is situated in the oases of Siwah some 220 miles from Aboukir, to consult the oracle, which very wisely proved favourable.‡

On his return to Memphis he found awaiting for him reinforcements from Greece. He thereupon hastened to organize his control over Egypt. He appointed his garrison commanders and ordered them "to allow the governors to rule their respective districts according to the ancient custom; but to collect from them tribute due to him." His method, throughout his reign, was the same. He separated civil administration from military control; the first he always handed over to the representatives of the conquered people, and the second he placed in the hands of one of his chosen Macedonians.

6. STRATEGY OF THE SECURE BASE.

Having gained command of the sea, I will now consider how Alexander gained command of the land.

After his great victory at Issus, Alexander did not pursue Darius, and some critics have been bold enough to accuse him of lack of strategic sense in not having done so. A brief examination will show that these accusations are not due to stupidity on the part of Alexander, but rather on the part of these critics who fail to grasp the true purpose of a war of world conquest. If we look upon war as an end in itself the object of which is to slaughter mankind, then we shall never understand the strategy of Alexander; but if we look upon it as a means towards attaining a secure and prosperous peace, then we shall. And, though

* An interesting account of Alexander's visit to Jerusalem is given by Josephus. See his "Antiquities," XI. 8.

† The Hebrew Sin (a marsh). In Ezekiel xxx. 15 it is called "the strength of Egypt."

‡ See Diodorus xvii. 51.

to refute this contention, instances of extreme barbarity on the part of Alexander may be quoted, such as the destruction of Thebes, of Tyre, and Persepolis, we shall discover, if we examine these acts in relation-ship to the conditions which surrounded them, that they were ordered, not so much to punish the Thebans, Phoenicians and Persians, as to attack morally the nerves of other would-be opponents. They were, in fact, undertaken in order to win submission by terror in place of by slaughter, and, consequently, in the long run they reduced bloodshed and facilitated conquest—they were shattering moral blows.

Issus had taught Alexander and his army that they had nothing to fear from Darius and his hordes. This being so, the annihilation of the Persian monarchy became for the time being a secondary problem to the security of the Macedonian base. Politically, this base was none too strong, and as long as it was possible for the Persians to run a few triremes laden with gold into Athens, the position of Antipater remained insecure, especially as Olympias, Alexander's mother, was always at loggerheads with the vice-regent.

Now that complete command of the sea had been gained, Alexander had nothing to fear; and as he had occupied Egypt, its wealth enabled him to strengthen his home government, and its corn to keep the Greeks contented.

7. THE GAINING OF THE POLITICAL OBJECTIVE.

In the spring of 331 B.C. Alexander bridged the Nile and marched back to Tyre where he found that his fleet had arrived. From Tyre he dispatched a strong squadron to the Peloponnesus to counteract the intrigues of the Spartans. Here we see the first fruits of his wisdom in gaining command of the sea. From Tyre he marched by way of the valley of the Orontes towards Antioch, thence turning eastwards, he debouched on the Euphrates at Thapsacus and in the vicinity of this town he founded the city of Nicephonium as a strong point and depot on his line of communications. At first he intended to cross the Tigris near Nineveh at the spot where Mosul now stands, but as he learnt that Darius with a large army was in this region, he crossed the river north-west of the old Assyrian capital, and then marching down its left bank met Darius, in October, at Gaugamela (Arbela), and decisively defeated him, though, unfortunately, in spite of a rapid pursuit, the Great King escaped him and sought refuge in Media.

From Arbela, Alexander marched to Babylon and there established a new base. Thence, in a twenty days' march, he proceeded to Susa, the Persian capital, and seized money to the value of 50,000 talents (£12,000,000). From Susa he fought a mountain campaign against the Uxians, after which he marched with all rapidity to Persepolis " before

the guards of the city could pillage the treasury." Here and at Pasargadæ* he seized 120,000 talents (£29,000,000). The possession of this immense treasure enabled Alexander to meet not only the cost of his campaigns, but to finance Antipater at home; further, it enabled him to reward his soldiers with the utmost generosity. Alexander never overlooked the financial object of his wars which was to enrich Greece and pay for his campaigns. As long as he could do this, he ran little risk of being left unsupported.

After his defeat at Arbela, Darius fled to Ecbatana (Hamadan) in Media, five hundred miles from Persepolis. As long as he was at liberty it was strategically unsound for Alexander to proceed eastward towards India, because Darius with his great wealth might easily raise another army and cut him from his base at Babylon. The capture of Darius became, therefore, Alexander's immediate and political objective.

Leaving Persepolis in the winter of 330 B.C., Alexander set out for Ecbatana, which was surrounded by seven walls, each over-topping the one before it, and each crowned with battlements painted in a different colour. In this superb city he seized 180,000 talents (£43,785,000), but unfortunately Darius again escaped him.

At Ecbatana he received large reinforcements from Greece, and after having deposited his treasure in this city, he once again set out in pursuit of Darius. In eleven days he covered 390 miles† and "came upon the barbarians just before daybreak, going along without any order and unarmed; so that only a few of them rushed to defend themselves, but most of them, as soon as they saw Alexander himself, took to flight."‡ Bessus, who had mutinied against Darius, and was conveying him a prisoner in a covered cart, hearing that Alexander was close by, assassinated the Persian king. On learning of this murder Alexander was both horror-struck and disappointed, as he had hoped to take Darius alive.§ He sent his body back to Persepolis to be buried in the royal sepulchre, . . . "his children received from Alexander a princely rearing and education, just as if their father were still reigning; and Alexander himself became his son-in-law."||

* Pasargadea was the old capital of Persia founded by Cyrus. Later on its place was taken by Persepolis as the summer capital and Susa as the winter.

† Plutarch, "Alexander," 42.

‡ "The Anabasis of Alexander," Arrian, III, XXI.

§ Darius would have been very useful to Alexander. He would have made him his friend and put him in charge of the civil administration of Persia. Alexander's policy was always the same—namely, to control and not to smash local government. Though a conqueror, he never assumed the position of a tyrant, such as Dionysius and Agathocles of Syracuse.

|| *Ibid.*, III, XXII. He married Barsine, the eldest daughter of Darius, also known as Arsinoe and Stateira.

With the death of Darius, Alexander's political objective was gained, and further consolidated by his marriage with his daughter.

The wealth of the country he had now conquered relieved him of all financial anxiety and, as was his wont, he established a just rule over his subjects, for he had no fear as to the future. All that now remained for him to do was to march northwards and eastwards until he could find some obstacle which would provide his immense empire with an unattackable frontier. He must have known of the Oxus and Jaxartes, possibly, also, he had heard of the Himalayas and the gulf of Bengal. If he could reach these, he could establish the strong boundaries he sought, and then retrace his footsteps and move on Carthage, on Rome, and into Spain, so that his empire might be bounded by great seas, mighty mountains and unfordable rivers, such alone were the limits of his ideal world state.

(To be concluded.)

THE DEVELOPMENT OF LEADERSHIP AND MORALE IN THE ROYAL AIR FORCE

BY WING-COMMANDER H. GORDON-DEAN, A.F.C., *p.s.a.*, R.A.F.

INTRODUCTION.

THERE is a story, some thirty-two centuries old, which throughout the ages has never failed to thrill the imagination.

The invader, with a countless army, had fastened himself at the heart of a small agricultural nation, and was crushing its life out of existence.

The oppression produced a leader, and the leader the followers.

The leader was Gideon—the followers were reduced to a handful of some 300 men, eager for the defence of their country. All men of doubtful value had been ruthlessly eliminated.

The Captain, by his fearless strategy and resolute followers, brought terror to the hearts of the enemy. What we would now call the Midianites “morale” vanished completely at the sound of the trumpets, the crash of the empty pitchers, the flash of the torches, and the assured shouts of victory. We are told they were completely routed, fighting each other in their confusion and panic.

Here surely we have a classic example of what leadership, morale, and strategy may produce against overwhelming odds. The lessons of this story persist throughout history. There are many modern counterparts, such as the inspiration and leadership of the Maid of Orleans, the amazing success of Wolfe at Quebec, the crowning exploits of Cromwell, Nelson, and many other national leaders, amongst whom some may place Mussolini as the latest example.

For despite modern developments in weapons and material, success in war still depends on these two great human qualities—leadership and morale—which are both indispensable and complementary to each other. Of these two, leadership is paramount, since without its vitalizing force the strongest morale will quickly wither and die.

LEADERSHIP.

The importance of leadership has always been recognized. We might describe a good leader as one who possesses the art of combining to the best advantage the spiritual, mental, material and physical forces at his disposal. The great Captains of the past have had their conquests analysed, dissected and discussed. Philosophers have

pondered over their successes, experts have stated this, that, or the other as the secret of their achievement. We are told, and readily accept the self-evident conclusions of these writers, that there are certain basic attributes of leadership, and that the degree of success achieved is often a function of the completeness with which these qualities are to be found in any particular illustration.

History proves that in every great leader some or all of the following are always to be found :—

Personal courage.

Sympathy.

Resolution.

Determination.

Self-discipline.

Experience.

Sense of duty.

And transcending all of these a knowledge and insight into human nature and the reactions of mankind under every conceivable condition in peace and war.

These are the outward and visible signs. What is the secret of their growth ?

Heredity, some say, played the greatest part in the lives of the great Captains of the war. Nature endowed them so magnificently with exceptional gifts that they were bound to succeed, whilst we, having but one poor talent, would fain "hide it in a napkin and bury it for ever in the ground."

A study of the history of the great men of the past, however, leads to a different view and to those who have been entrusted with the privilege and responsibility of command in however modest or obscure a position, and whose ambition it is to serve to the best of their endeavours those whom they follow and those whom they lead, the lives of the world's great leaders provide perhaps the greatest inspiration and example.

The inspiration is to be obtained from the magnificence of their performance, the brilliance of their achievements; the example from the devotion of all their abilities to the task of fitting themselves for the responsibilities of leadership.

The world ever applauds dazzling achievement, but sees little of the labour by which success is gained. Perhaps one of the exceptional features of Napoleon's victories was his amazing grasp of weak points in his opponents' morale and physical forces.

His knowledge of the psychology of the enemy and their leaders enabled him to break many of the so-called "principles of war" with apparent impunity, to take great risks and to do so with success. Was

this but one of many gifts of genius which Nature had gratuitously endowed him?

The available evidence points to a contrary conclusion. It was only by the most unflagging efforts of will power, concentration and incredible labour that he fitted himself for his task.

We begin to discover something of the foundations for this penetrating insight into human nature when we read that at the age of eighteen, "despite ill-health, family troubles and the outbreak of the French Revolution, he grapples with the history, geography, religion and social customs of the ancient Persians, Sythians, Thracians, Athenians, Spartans, Egyptians and Carthaginians."*

This study of men was never abandoned during his career. In his retreat from Moscow, biographies of the opposing Russian Generals were captured among his private papers, and his dictum "to read and re-read the campaigns of the great Captains" is too well-known to need comment, except to emphasize again the supreme importance he placed on a knowledge of the psychology of human nature under all conditions.

By study, deduction, observation and practice, Napoleon wrestled with a task of gigantic magnitude.

It would be difficult to prove that he was born with a single one of the attributes of leadership already mentioned. That he inherited exceptional mental powers is not denied, but it was only by unreserved application of these and by the devotion of all his energies to the task in hand that the full fruits of leadership were attained.

A study of the life of Sir John Moore brings out similar characteristics. His military training commenced at the age of fourteen, and during the whole time in the Army he sought active service wherever it could be found. When stationed in Ireland in 1798 he writes:—

"Our business, like every other, is to be learned only by constant practice and experience, and our experience is to be got in war, not at reviews."

This was the officer whose campaign in Spain against Napoleon has been described as:

"The boldest, the most successful, the most brilliant stroke of war of all times."†

This again was the officer whose penetrating insight into the needs of the Army, whose grasp of the value of comradeship and regimental honour, and whose tireless energy enabled him to carry out his great work in the training camp at Shorncliffe, where the officers and men who served so splendidly in Wellington's army received their training.

* "Life of Napoleon," J. H. Rose.

† "The Diary of Sir John Moore," Maj.-Gen. Sir J. F. Maurice.

In the words of Major-General J. F. C. Fuller : " He instructed his officers *how* to teach their men, *how* to care for them, *how* to win their loyalty and respect. He set so high an example to his soldiers physically and morally that he awakened within them not only a pride in him as a leader, but the pride of each one of them in themselves as the followers of such a man. His discipline was based on respect, not on fear ; it was fed on efficiency, not on tradition. And the result, the *esprit de corps* of Shorncliffe."^{*}

Could results such as these have been produced by any leader who gave but half-hearted interest to his profession, to his men, to his cause ?

Herein lies the difficulty—so often overlooked and so seldom mentioned—the great prices that must be paid before success in any degree can be achieved.

For if one factor more than any other stands out about the great Captains of the past, it is the whole-hearted surrender of themselves, their talents and their very lives, to the mastery of their profession, to the men whom they led, and to the cause for which they fought. Once this price has been freely paid, the rare fruits of leadership will surely follow—to some thirty, some fifty, and some an hundred-fold.

What is the stimulus which has urged men in the past to devote themselves with such zest to these objects ?

In some, heredity undoubtedly played a large part ; in others oppression produced the inspiration, whilst family pride, patriotism, religion, sense of duty, and personal ambition have all been impelling causes.

Napoleon wrote : " I was born when my country was perishing. Thirty thousand French vomited upon our coasts, drowning the Throne of Liberty in waves of blood ; such was the sight which struck my eyes."[†]

His savage desire to liberate his native country undoubtedly inspired him in his boyhood days before personal ambition became the paramount factor.

This incentive of personal ambition, whilst a natural and healthy stimulus, is a human characteristic that needs to be kept strenuously under control, for if self-seeking motives are allowed to gain the upper hand disaster is bound to ensue.

It was perhaps the unbounded pride and personal ambition of Napoleon that, in the end, more than any other factor, led to his warped judgment, faulty decisions and ultimate downfall. In the words of a writer on this point :

" Considerations of time and space, appreciation of the enemy, of the

* " Sir John Moore's System of Training," Maj.-Gen. J. F. C. Fuller.

† " Life of Napoleon," J. H. Rose.

limit of human endurance, all possibilities, reflection and wisdom had been swallowed up by, and had disappeared in . . . the abyss of limitless pride."*

This aspect is emphasized here because, in peace time especially, it usually happens that many of the more spiritual inspirations are not present in any marked degree, and personal ambition, unless kept in hand, may play too large a part as the incentive to success.

Probably, however, in most of the great leaders the incentive was a combination of most of the impulses mentioned above, though, of course, in varying degrees. Certainly where religion or patriotism have held the dominating note, the leadership produced has been of the noblest type.

What could be more inspiring than Garibaldi's famous appeal to his countrymen :—

" I offer neither pay, nor quarters, nor provisions; I offer hunger, thirst, forced marches, battles and death.

" Let him who loves his country in his heart and not with his lips only follow me."†

MORALE.

Very little has been said so far, except by inference, about the great quality of *morale*. This might perhaps be described as a measure of the collective will power to succeed that permeates all ranks of a force. We have stated that its structure undoubtedly rests on the foundation of leadership.

Even in peace time, when there is no great captain to inspire and lead men to victory, it is the work of the subordinate leaders to engender and nourish this quality throughout all those under their command.

The factors necessary for the production of morale are as well-known as those for leadership, and the writings on the subject are equally voluminous.

Confidence, courage, ambition, comradeship, discipline, self-respect, adequate weapons, training, sense of duty, patriotism, and religion are perhaps the most important.

The regimental system—evolved on the lines of Sir John Moore—has proved ideal in our Army for the closest interaction of leadership and morale.

We have often lacked leaders—in times of crisis, whom the world would judge great in any spectacular way—but the morale of our Army has been guarded and kept in the past by the devoted service of countless subordinate Commanders, bound to their regiments by ties of family tradition, loyalty and comradeship.

* "The Psychology of Napoleon," by Gen. Watts, *R.U.S.I. Journal*, November, 1925.

† Garibaldi in the Defence of Rome," Trevelyan.

War is, and will ever be, a matter between human beings, and although there has been a revolution in scientific developments, unless there is a corresponding revolution in the heart of man, the intimate relationship between mankind will still be the greatest factor in the art of war.

Whatever may be the progress of science, however vast and complicated may be the fighting forces of the future, the great captain whenever he arises, be he an Alexander, a Napoleon, or a Nelson, will, by the genius of his leadership and influence, dominate and inspire the humblest of his followers.

His task, however, will be more rapidly accomplished if the instrument is ready and at hand and if the quality of high morale has already been established throughout the forces placed under his command.

THE ROYAL AIR FORCE.

Turning now to the Air Force, there are difficult problems to solve in these matters.

The air service is, so far, neither inspired nor hampered by old traditions.

The bond of common service and sacrifice found in Navy and Army between officers and men is almost entirely lacking.

A large proportion of the officers who carry out the active side of flying operations are almost similar to the old mercenaries—hired for a limited contract. The Air Force to them can be nothing more nor less than a stop-gap job. How, then, can one expect them to devote themselves whole-heartedly to its service?

The commanders who order and direct air operations cannot in general take any part in them.

Regimental spirit on army lines is apparently impossible to produce.

On what, then, is morale of leadership based? What has been the incentive, which we have tried to show is necessary, to cause men to pay the price to fit them for successful leadership?

First and foremost is the pioneer spirit, the quest after achievement in the uncharted spheres of air activity. This incentive alone has been found to produce in the British race men eager and willing to devote their very lives in such a case.

Secondly, there is the love and enthusiasm for the work itself, the keenness to succeed, to excel, to create; the ideals of efficiency and perfection.

Finally, there are those other great ethical qualities mentioned above, sense of duty, patriotism, religion, which have always proved the highest inspiration for the work of leadership and the surest

foundation for the development of morale. These motives, often subconscious, may be found in varying degrees in the elemental instincts of all the human race.

Leaders in the past have often had time to prepare, but in the air service, more than any other, the instrument must be at hand ready and efficient.

Preparation of the air arm in peace can only be accomplished by the united efforts of those who are determined to devote themselves without reservation to its perfection. This is the price that must be paid by those who would serve the Royal Air Force best.

The more this ideal is accepted, the more certainly will the valuable fruits of leadership and morale be garnered. There is nothing new about this. It is simply the doctrine of common *service* enunciated by the greatest Leader the world has ever seen.

PSYCHOLOGY

BY SQUADRON-LEADER A. ROWAN.

*The eye—it cannot choose but see;
We cannot bid the ear be still;
Our bodies feel, where'er they be
Against or with our will.*

I. PRELIMINARY STUDY.

To the average serving officer the word psychology means something which is beyond him, something which is the business of specialists, and no concern of his. Nothing could be really farther from the truth. It is true that the *theories* relating to various aspects of psychology, although very fascinating in themselves, are no concern of the serving officer. That he should begin his career, however, by possessing a sound foundation on which to build up a reliable knowledge of human and social psychology for himself is a need which no one can dispute. The advance which has been made in the study of the mind has been so great, that from the mass of knowledge gained it is possible to select certain items which will help us to understand ourselves and the behaviour of others.

The lack of such knowledge makes itself very noticeable amongst people generally, and amongst officers of varying rank. It shows itself in a variety of ways in dealings with other men. There are some natures in a certain state of development who demand praise and never get it. To get *the best out of* such a man, occasional praise will bring out the best in him; he will redouble his efforts and work unremittingly. On the contrary another man will display marked conceit and a degeneration of character through praise. Our judgment of value and merit are rooted in our sentiments, and so also are our moral principles, and a sound knowledge of the sentiments is of great assistance in everyday life. Again, a highly intelligent and vital personality put on to "humdrum" work will show rapid signs of irritability and dissatisfaction, and lose his social value. There are numberless problems occurring in daily life which become easy of solution with a knowledge of the other man's make-up. A basic knowledge of psychology, therefore, which helps us to understand the working of the human mind, is of great assistance to ourselves, and helps us in the treatment of others.

Let us take for a moment the word "morale," so often misspelt "moral." Morale is the collective state of mind of a group of men as it is reflected by their behaviour under varying conditions. Now a lecture on morale can do no more than make us aware of the meaning of the word. The qualities are partly psychological (*esprit de corps*, patriotism, leadership), partly physiological (physical fitness, habit), and environmental (living condition). To produce a high morale merely by having the word explained and then acting by rote alone may lead to disappointment and failure. The functioning of the qualities is not constant, and differs in different races. It is just as important in Service life to know something about the destruction of morale. During the last war one of the factors which destroyed the morale of Bulgarian troops was contributed by the Central Powers themselves. The house-to-house visitation in which cloth, and copper utensils were systematically taken, was responsible for wholesale desertions, in order that the home-loving Bulgar could attend to home affairs. The word "morale" must become alive in our comprehension in order that we can apply its meaning in practice—and that is what really matters.

The knowledge of certain simple scientific facts is of the utmost value in helping us to understand human behaviour. Noise, as noise, has proved to be capable of producing sickness in a person. Typists have been shown to be far less efficient in the presence of air oscillation. We cannot all be expected to study every type of scientific work, but it is maintained that any piece of knowledge acquired and stored away in the memory is going to make it easier to understand the behaviour of our men and brother officers, and to help towards improvement whether in the office, mess, squadron or workshop.

We cannot proceed to the daily life aspect of psychology without knowing something of what it really means, and it will be necessary, therefore, in this first paper, to arrive at a working conclusion of what a man really is as we see him.

If a pilot enters his aircraft and sits on a drawing pin placed there by a friend, what will he do? *We do not know!* If he was nicely brought up, and has just been through Cranwell, he may say: "Oh, bother, whatever is that?" If he has been in the Service some years, he may lose his temper, substitute quite another word for "bother," and may even delay his departure to find out who did it. The important point is that we cannot *predict*. We can predict, however, that if we stall an aeroplane its nose will drop, because of the law of gravitation. Two important points emerge from this:

(a) Psychology is a scientific study which tries to give an account of the way in which the mind works.

(b) It is still largely in the province of speculation, because we cannot say that the mind will always respond in the same way to the same stimulus.

An example of this has just been quoted, in which the stimulus was a physical thing—a pin. Here is a more striking example, the stimulus being a meaning. A lady gets a telegram which says: "Your son has crashed—little hope." The lady may faint, and on recovering may be quite distraught. An acquaintance also reads the telegram (the same stimulus) and expresses his sincere regret. The omission of the letter "Y" in the telegram: "Our son has crashed—little hope," and a polite inquiry might be sent.

A curious thing about the study of psychology is that when it does obtain a piece of definite and agreed knowledge, it turns out to be something to do with the body or brain. The brain is material, mind is not.

One thing is quite certain, and is also very important; there is a close relationship between the body and the mind. They are continuously influencing one another. After a really satisfactory guest night, I may pass into a state of complete beatitude and see two of everything all the way home. If I am unable to digest what the Mess contractor provides for supper, I have a nightmare, and may even be cross at breakfast. On the other hand, if I receive a sudden mental shock I go pale, and my body may shake. The examples given are very obvious cases of what is happening all the time in a much more intricate and obscure form. The result of this interaction brings us up against a problem. How can this *Mind*, which is immaterial, influence the body, which is material? You cannot stamp on a wish with your boot, nor can you start an aeroplane by thinking of it.

Must we postulate a mind or can we leave it out? This brings us to a consideration of the apparatus, *i.e.*,

THE NERVOUS SYSTEM.

I have settled down in a comfortable chair in the Mess ante-room after lunch in order to sleep. This is against Mess rules, and an officer, seeing me there with my eyes closed, proposes to wake me by jabbing a pin into my hand. He does so. I instantly, and apparently automatically, withdraw my hand. What *really* did take place? The pin stimulated the terminals of the nerve cells or neurones in my hand. These nerve cells are in contact with others, and we get an enormously rapid telegraph system to the brain. We must, however, follow up the actual machinery of transference. Each neurone has filaments attached to it, known as dendrites. One of these filaments is much longer and finer than the others, and is known as the axon, and it is

through the axon that the stimulus or impulse passes through to the next neurone or nerve cell in the chain. The points where the axons communicate are known as *synapses*, and act as valves. They allow the impulse to pass in one direction only and prevent it from returning. These valves will be referred to again later, as they may be very important in the forming of habits. The impulse now travels along the main avenue of all impulses, the central part of the nervous system, which runs up the spinal chord, and so the pin prick reaches my brain. Here it is received into a very complicated system of layers of neurones. As I am going to withdraw my hand, a message to do so must be telegraphed down to my fingers again by the brain, and so the stimulus is transferred to another system of neurones, the effector, or motor nervous system. These govern the movements which we make, as opposed to the receptor or sensory nervous system, which deals with the sensations we feel.

It therefore looks as if the whole process is automatic. If it is not, then we must assume that the nervous chain is broken. Now if *I make up my mind* not to withdraw my hand, I need not do so. For the practical purpose of this paper, and without going into technical arguments, we shall accept that the nervous chain is broken by the existence of Mind, because any attempt to interpret the behaviour of living beings in terms of material response to stimuli must inevitably break down.

THE MIND.

We must get some idea of what the Mind means. One of the characteristics of man is the capacity to be influenced by and to work for a *purpose*. It is something which lies in the future and which the mind tries to achieve. This capacity is mental. We are trying to bring into existence a situation which does not exist. We possess foresight, expectation and creativeness, and what is very important, *we are influenced by the past*. The fact that I can bring off a successful forced landing to-day under difficult circumstances lies in the past. I learnt to fly and have had previous experiences. Not only do these remarkable powers in man suggest the existence of mind as apart from brain, but they also show that three things are happening in the mind when a sensation from outside comes along :—

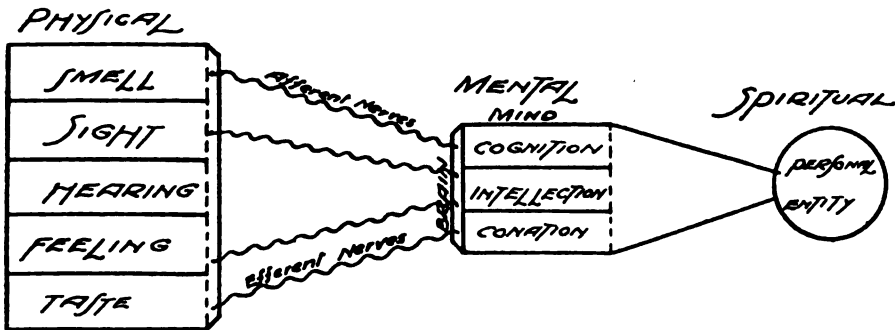
- (a) A process of knowing (cognitive);
- (b) A process of feeling (affective);
- (c) A process of striving (conative).

In any particular experience, any of the three may be more prominent than the others, but each one of them is present all the time. We may compare the mind then to a water-filled receptacle in which

the waves of knowing, feeling and striving are continually changing their form and merging into one another. The interaction of the three is responsible for thought, which may be described as the faculty of interpreting our perceptions and of linking them up with others, or in other words, finding a meaning for them.

When this meaning has been found, and the mind has dealt with the sensation or experience, what becomes of them? They are transferred to become our personal psychological entity. Leaving out a discussion of heredity for the moment, *I am what I am to-day because of all my previous experiences and how my mind has interpreted them* on a background of heredity.

MAN



To sum up; there can be no question that a living organism is something much above the actual matter of which it is composed; that it is really an expression of the principle of life, and that life is a force or entity which cannot be satisfactorily explained in material terms. In human beings, this principle of life expresses itself at the level of what we call mind, which is distinct from the body and brain, and is able to act on its own volition, and produce occurrences apart from gland activity, or bodily responses to external stimuli. The practical outcome of the foregoing is:—

- (a) That we are all the outcome of *our* interpretation of our previous experiences—plus heredity.
- (b) That the inter-relation between mind and body is so close that the condition of the one will affect the other.

We cannot close this part of the paper without making reference to the

INSTINCTS.

These are the basic foundation of man's behaviour and of his mind, and we may here best follow McDougall, who gives the following three as the primary instincts, with their emotional equivalents :—

INSTINCT.	EMOTIONAL QUALITY.
Self-preservation (danger instinct).	Fear (terror, fright).
Pairing (sexual instinct).	Lust (sexual emotion).
Social instinct.	Feeling of loneliness and isolation.

Dr. F. A. Shand goes a little further and says that in addition to our instincts our psychology contains factors known as sentiments. A sentiment is formed by a group of instincts and emotions which are centred round a particular object or idea—love and hate being typical sentiments. For practical purposes this is a very valuable addition, for it makes it possible for us to conceive the idea of a man's character being built up on a system of sentiments. His character he makes for himself, as we have seen, but the direction in which he will tend to build his own character depends on the sentiments inculcated in him in childhood, by his parents, and in the nursery.

With the foregoing knowledge thoroughly imbibed, we shall be able to follow and begin to understand the workings of the human mind in everyday life, an account of which is to follow.

(To be continued.)

SOME BRIEF COMMENTS ON AN IMPORTANT SUBJECT

By "ASP."

By the publication of the article on "The Basic Principles of Air Force Organization" in the July issue, the R.A.F. QUARTERLY is to be congratulated on making an effort to interest the personnel of the air force in what to them is a most important subject.

The value of the original article has been increased by the subsequent letter from its writer, modifying and amplifying some of the views originally set forth.

In a young service too much attention cannot be devoted to ensuring that the basic organization is founded on sound and workable principles, which will allow for future contingencies and eventual expansion. Rigidity in organization is to be deprecated, but nebulosity is an even more dangerous error. It is proposed to review briefly in this short article the evolution of air force organization and to trace the factors which have affected the lines on which it has so far progressed.

Before doing this, historical precedent is worthy of consideration. It is a remarkable fact that owing to an innate conservatism in the mentality of fighting personnel, the phases of organization in fighting services have often been marked and even inspired by catastrophes. Lack of sound British naval organization led to the outstanding Dutch successes in the middle of the seventeenth century. The subsequent reforms paved the way to later triumphs. The maladministration of the army was searchingly investigated as the result of the Crimean miseries. These are only two of the many examples which could be quoted from our own history.

Lord Wolseley spent many years in urging consideration of problems of army organization with but little success. When, however, the rigid ideas proved so unadaptable in the Boer War, public misgiving was aroused. Under the direction of Lord Esher, drastic reforms were initiated in 1904 and as a result of these the army was able to pass through the test of the Great War with an administrative history entirely admirable.

Events such as these were beneficial in the long run, but it is

infinitely more desirable that advantage should be taken from lessons of the past. Evolution of organization of armed forces should follow in future a general and ordered line of progress and not attend upon unpleasant investigations as the result of widespread national misgiving.

What are the prospects of the air force in this respect? Is our present organization such as will justify, under the strain of war, the quality of our flying personnel and the excellence and reliability of our technical material? Let us trace the early development of the Royal Air Force and investigate the administrative atmosphere in which it was created.

It was originally compounded of the R.N.A.S. and the R.F.C. The R.N.A.S. was raised from the executive branches of the Navy, leavened by civilians in whom enterprise and bravery were more marked than administrative talent. The executive side of the Navy has little ordinary concern with administration, except so far as discipline is concerned. A fighting ship puts to sea as a self-contained unit, provisioned, fuelled and armed from the dockyard. Its interior economy is controlled by specialists who have little liaison with the fighting personnel. In these circumstances the R.N.A.S. had little in its early traditions which led it to be vitally interested in the higher aspect of organization.

The Royal Flying Corps was little better off in this respect. It was a corps of fighting troops within the organization of a great army; and supporting it in the field was the highly efficient army administrative staff and the army's ancillary services. It had only to make known its wants and from the army's depots and along the army's lines of communication, all controlled by outside personnel, its wants in other than purely technical material were expeditiously filled. The corps was never seriously concerned with general administrative problems other than the sole question of technical fighting material, and even the situation regarding this form of material was peculiar.

Flying was in its infancy; progress in aircraft construction was phenomenal; and the war was a long one. The advances made in aircraft were so marked that each new step had immediate repercussion upon tactical problems, fighting methods and air supremacy. Material development was interlinked with air operations in a way that is unlikely ever to recur. Development in aircraft construction can never again respond so vigorously to the stimulus of war. The capacity for production will be devoted to replacing wastage and have little of the extensive time now necessary for fresh researches. In future, air forces will probably fight throughout a war with aircraft differing only in minor

degree from their original equipment. The continuous and vital importance of linking technical development with air operations was but a passing phase.

Both these factors had a lasting influence upon the Royal Flying Corps. There was little necessity to worry about general administration, supplies, lines of communication, base areas, and all the complexities attending the working of a fighting force in the field; tremendous importance was attached to, and first-hand knowledge was required of, technical development by the operations staffs.

Compounded from these two sources the Royal Air Force commenced its life in 1918. In the course of just over a year the service had been reduced almost to a cadre and had to make a fresh start. Ever since that moment the problems of increased responsibility, of expansion, and of political questions have been paramount. Operational responsibility within the Empire has taken precedence over complex administrative matters, and the general organization, like Topsy, has "just grewed."

In a young service everything has been on trial. It all had to be closely watched and amended. By no means all the staff officers were trained and the average officers were young. It was consequently natural that in the Air Ministry, and in commands, commanders tended to deal with much detail at first hand and to shape their headquarters organizations to meet immediate requirements and personalities.

No previous experience urged the Service to consider from time to time whether development was being made on entirely sound lines. Headquarter establishments of the various commands were not uniform, even in important details, neither were the functions of various components of these headquarters very clearly defined. It was not questioned whether the organizations, both at home and abroad, which seemed to meet fairly well the day-to-day requirements of peace and small operations, would stand the strain of real war—war in which the air force would not function as a corps of the Army, nor like a fighting vessel of the Navy, but as a fighting Service responsible for the entire forces, whether fighting or ancillary, within its theatre of operations.

The time has come when this question is being faced, and in facing it a most important factor must be considered. It is only reasonable to suppose that, in war, a commander of forces so rapid in operation as aircraft, will find it essential to keep himself free from unnecessary detail, so as to be able to appreciate each war situation as it arises and to come to immediate and frequent decisions. To do this a break must be made from the old traditions of centralization, and the commander must delegate responsibility. The routine life of the force must be

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entrusted to capable subordinates. The commander, assisted by a small band of highly trained staff officers, should decide on general policy and ensure that the enemy is met and defeated. On the lines of policy, as indicated through the staff, experts should ensure that everything which can be divorced from actual fighting is kept at its highest pitch of efficiency.

This system, in its principle, is nothing novel. The organization of the Army, which was adopted as the result of the investigations under Lord Esher in 1904, follows these lines. Further, to obtain the benefits of war experience, a very influential committee was convened by the War Office in 1919 under the presidency of General Braithwaite. In accordance with the opinion of almost every important British Commander, this committee expressed satisfaction at the way in which the staff system had allowed of control, by directors of services, of routine administration, thereby freeing the commanders, assisted by their staff officers, to devote themselves to important policy.

There is no difference in principle between the control of fighting on land and of fighting in the air, except perhaps that in air warfare the speed and intensity of the operations will be more marked.

An organization on these lines has been worked out for the Royal Air Force in war, but so far the peace headquarters seem to have conformed very little to this war organization. Some of the changes necessary to bring this about will take time and much work to effect, but the consideration of them should not be too long delayed. It is a truism that the transition of a fighting service from peace to war should never involve any fundamental change of principle. Yet, at present, many inconsistencies and peculiarities can be found in the various air force command headquarters, and even in the Air Ministry itself. It is not for the writer to point these out. He only wishes to draw attention to a most important subject and to put forward what experience in another Service has shown to be a satisfactory arrangement.

The headquarters of an air force should consist of a commander and a limited number of highly trained staff officers, amongst whom the control of policy of operations, personnel and equipment, including supplies, quartering and movement, is divided. The activities of the staff should be co-ordinated under two or three principal staff officers. None of these staff officers should have executive responsibility. Signals, medical services, technical maintenance, supplies and transport, all of which are specialist duties, will each come under its specialist head, who, whilst being in executive control of his organization, will receive through the staff the lines of policy upon which he will work.

Assisting these heads of services and the staff there should be a very limited number of expert advisory officers who deal exclusively with such problems as legal work, or research and development which have no immediate executive connections.

Some of the changes to bring about this state of affairs are radical ones, and in the existing equipment branches will need very careful investigation. In the long run, however, they should be amply justified. It is better that they should take place in times of peace than be deferred until important events have perhaps proved too conclusively that the present peacetime headquarters organizations of the air force are inadequate to stand a suddenly imposed stress of war.

THE FOG OF WAR

BY GROUP-CAPTAIN L. A. PATTINSON, D.S.O., M.C., D.F.C.

VOLUME III of "The War in the Air" contains the official history of the Battle of Arras, and is therefore of extraordinary interest to the student of air warfare, as describing the most powerful German effort to destroy the supremacy of the Royal Flying Corps on the Western Front.

The picture that is painted by the historian is one of gloom, relieved by two bright points: the valuable assistance that was given to the attacking troops by the corps squadrons and the general preservation of high moral, in spite of repeated failures, on the part of the fighters of the Headquarters and Army Wings, to maintain their offensive rôle on the German side of the lines.

Our losses were appallingly heavy, and the enemy's fighters possessed an overwhelming advantage in a superiority of performance that gave them the choice of accepting or refusing combat and enabled them to escape when out-fought. As further depressing the scales against the R.F.C. must be added other factors, which are recorded in the official history, and were, moreover, fully apparent to the majority of the fighting pilots.

During the critical days of the battle the offensive patrol areas were situated well outside gliding distance from the British front line and in some instances as far as thirty miles beyond it, whereas the formations that were required to occupy them were frequently prevented from doing so, by the necessity of defending themselves against the attacks of German patrols near the trenches. Having reached their assigned areas the British fighters lacked the speed that they needed for offensive action, and were compelled to rely for fighting on such enemy formations as, being numerically or otherwise superior, chose to attack them. On return they were not infrequently depressed by the news that a number of artillery observation and close reconnaissance machines had been shot down by single-seaters that, having avoided or evaded the outer patrols, had harried the B.E.'s with impunity. The wind generally blew from the west, thus sealing the doom of any fighters that were disabled at any considerable distance beyond the lines.

Volume III makes it clear that the balance of loss was greatly in favour of the enemy, as was, indeed, the natural result of the conditions under which the fighting took place.

Weighing the factors of material inferiority, overwhelming casualties, loss of tactical initiative, failure to prevent the enemy from interfering with the vital work of the corps squadrons, and, last but not least, the certainty of capture in the event of engine failure or other disablement, the student of war may well regard as incredible the assertion that the offensive spirit of the R.F.C. was maintained throughout the battle.

It is here suggested that the explanation of this phenomenon does not solely depend on the fighting qualities of the pilots and observers, magnificent though they were proved to be, but must also be sought in the conditions of air-fighting over enemy territory. Those conditions, on the one hand, kept the survivors clear of such detailed horrors of war as were ever present in the life of the soldiers in the trenches; and, on the other hand, made it generally impossible to ascertain the fate of a defeated enemy, who had been driven down—to crash, to land safely though disabled, or merely to escape from an awkward situation.

There can be no doubt that the inability to deal with their own wreckage, combined with the reasonable assumption that they had destroyed a much greater number of the enemy's aeroplanes than ever swelled the German casualty lists, did much to maintain the spirits of our squadrons.

Apart from these inevitable results of the fog of war, it may be doubted whether the account of an air battle, based on salient facts as recorded mainly in the archives of the higher formations, gives a true picture of the detailed fighting, as seen by the combatants and as affecting their moral.

Both as a striking example of the differences between historical record and contemporary belief and as a tribute to the memory of the officers who took part in the action, the following stories of No. 57 Squadron's dawn patrol on April 30th, 1917, taken respectively from "The War in the Air," Volume III, and from entries in the Squadron Commander's diary will, it is hoped, prove of some interest.

EXTRACT FROM "THE WAR IN THE AIR," VOLUME III.

"The 30th of April was notable for a change in German air-fighting tactics. The fighter flights attached to the Arras Corps at Douai (3rd, 4th, 11th and 33rd) were combined to form one group which could, as occasion demanded, operate as a massed fighting formation. This group, which made its first sweep on the morning of the 30th, was promptly named by us 'Richthofen's Circus,' although, in fact, the first fighting squadron under Richthofen was not formed until June. . . . The new group, numbering twenty single-seaters, in two formations, set out from the Douai Aerodrome on the morning of the

30th. Their first encounter was with seven F.E.2d's of a line patrol of No. 57 Squadron and three Sopwith triplanes of No. 8 (Naval) Squadron. Two of the F.E.'s were shot down in the German lines, and a third, with a wounded pilot and a dying observer, crashed in the British area.

"The triplanes succeeded after a bitter fight, during which several German fighters were driven down, in extricating the four remaining F.E.'s.

"The enemy group then turned away, joined a number of two-seaters, and, shortly afterwards, came up with a formation of six Bristol Fighters on their way, escorted by five Sopwith triplanes, to reconnoitre a reported trench system east of Douai."

Account compiled from the Squadron Commander's records :—

"Six F.E.2d's of No. 57 Squadron left the ground at about 6 a.m. for offensive patrol a few miles beyond the trench line.

"Finding no enemy aircraft in this patrol area but seeing some near Douai, some miles further east, they interpreted their instructions liberally and moved to the attack.

"An F.E. dived on one of the enemy, followed by a German single-seater, and, in sequence, by a second F.E., with the result that the first F.E. and the single-seater were shot down. The fight then became general with about fifteen Albatros Scouts. Including those already mentioned, the casualties in this engagement were one F.E. destroyed and one disabled, which, however, reached its own side of the lines and landed with pilot and observer unhurt. Of the Germans, one Albatros was shot down; seen falling out of control near the ground, and therefore presumed to have been destroyed; two more were disabled and seen to make forced landings in fields.

"After driving away the remaining enemy machines, the four survivors of No. 57 Squadron's formation flew west to regain the patrol area.

"In the meantime a solitary F.E. engaged in an engine test had incautiously crossed the lines. Two Albatros Scouts approached and dived to attack this machine. One of the enemy was engaged by one Sopwith triplane.

"The F.E. out-manceuvred the second Albatros and shot it down, its destruction being presumed from the statement of the Sopwith pilot, that he saw it still falling out of control at a low altitude and unpursued. Shortly afterwards another Albatros attacked the F.E., and was also outfought, but in this instance the observer's gun jammed at the critical moment. The pilot fired ninety rounds from his fixed Lewis gun at close range from a favourable position, after which the enemy disappeared from sight in a steep dive.

"The patrol formation was then sighted approaching from the East at about 8,000 feet, and the lone E.E. at 6,000 feet flew to join it.

"Before the F.E.'s had met an attack was delivered by about fifteen German single-seaters, which approached from the west with considerable advantage in height. These were later joined by five or six more of the enemy, and the combined force of approximately twenty Albatros Scouts split into two parties, of which the larger engaged the four F.E.'s and the smaller, numbering six or eight, attacked the isolated British machine by means of a series of individual dives in rapid succession.

"There were thus two separate actions. In the former, the enemy appeared unwilling to force a decisive result, and contented themselves with a relatively long-range fire and half-hearted attempt to break up the formation.

"The result of this was the loss of one F.E. and the disablement of one Albatros, which disappeared from view.

"Against their single victim the Germans showed a bolder spirit. A long and intense fight ensued, in the course of which the crew of the F.E. found little spare time in which to note the effects of its fire. One Albatros was seen to be hit and to dive away emitting smoke or steam from its fuselage. The F.E. eventually recrossed the lines in safety, after clearing the air of its attackers and flying alone at 4,000 feet, against the wind, for five or six miles.

"The three survivors of the patrol formation also returned, unpursued."

The following summary compares the salient points in the above two accounts of No. 57 Squadron's fighting on the morning of April 30th, 1917:—

"THE WAR IN THE AIR."

The enemy single-seater group numbered twenty in two formations.

The first encounter was with seven F.Es. of a line patrol of No. 57 Squadron, and three Sopwith Triplanes of No. 8 (Naval) Squadron.

Two of the F.Es. were shot down in the German lines, and a third, with a wounded pilot and dying observer, crashed in the British area.

SQUADRON ACCOUNT.

The seven F.Es. of No. 57 Squadron fought, in the aggregate, approximately thirty-seven single-seaters, in the course of five separate engagements.

The F.E. patrol consisted of six, which was the normal formation strength. Their duty was an offensive patrol beyond the lines, and not a "line patrol," as defined in 1917. There was a seventh independent F.E. in action. Two F.Es. were shot down in the German lines. A third was disabled, but landed in the British area, with pilot and observer unhurt.

The triplanes succeeded, after a bitter fight during which several German fighters were driven down, in extricating the four remaining F.Es.

Only one triplane was reported as in action. It engaged one or two Albatros Scouts that were approaching a solitary F.E. No. 57 Squadron shot down two enemy single-seaters out of control, one of which was reported by a pilot of another Squadron. The F.Es. also drove down four of the enemy disabled.

The four remaining F.Es. came home against the wind from five miles beyond the lines, after beating off the attacks of an enemy that was in a numerical superiority of about 5 to 1.

During the closing engagements no Sopwith Triplanes were seen.

The morning's work was a spiritual tonic for the officers of No. 57 Squadron.

In their opinion, seven of their obsolete F.E.'s had met and defeated five times their number of the most efficient German fighters, with the loss of only two pilots and two observers.

In the course of prolonged fighting, in which the enemy had possessed every tactical advantage, the Squadron had shot down two of the enemy to what appeared to be certain destruction, and had disabled four more, of which only two were known to have landed under control.

IS THE HEAVY FIGHTER DESIRABLE OR NECESSARY ?*

BY SQUADRON-LEADER J. O. ANDREWS, D.S.O., M.C., *p.s.a.*

SEVERAL points of operational interest are raised by Air-Commodore Chamier's article, "The Heavy Fighting Aeroplane," in the July R.A.F. QUARTERLY. The views expressed are so opposed to the generally accepted theory and current practice of air tactics as to demand close examination and full criticism. Air-Commodore Chamier urges that the present type of single-seater fighter carrying machine guns, whilst effective against other S.S.Fs. or single aircraft, is impotent against a day bomber formation. "Ignoring evasion," he says, "bombers," by means of their defensive fire power, "burst their way through fighters" and "reach their objectives with comparatively little loss." Hence he argues, some other type of aircraft is essential to break up a bomber formation as a prelude to the attack of the individual aircraft by S.S.Fs., and the best type for this purpose is a heavy fighter with a shell-firing gun (and/or bombs) which can keep out of range of machine-gun fire.

The introduction of any new class of aircraft complicates supply, maintenance and training. These are factors of appreciable magnitude in peace, and in war assume even greater importance. Hence a proposal of this sort must be thoroughly scrutinized and rejected if the new class cannot be shown to be operationally essential. We have, therefore, in the first place, to be satisfied that the present type of S.S.F. is, beyond reasonable doubt, ineffective against a bomber formation, *ignoring evasion*.

It is not clear on what particular phases of the 1914-18 operations Air-Commodore Chamier bases his conclusion that the S.S.F. has proved so definitely a failure against the day bomber formation—a conclusion which will surprise many pilots of appreciable air-fighting experience. Our knowledge of S.S.Fs. opposed solely by the defensive fire power of formations is relatively small. The situation was usually complicated by escorting fighters, by offensive patrols of S.S.Fs. or two-seater fighters, and by evasion. *The Official History of the War in the Air* states in respect to the operations of 1916, which comprised intensive bombing :—

* See Vol. II, No. 3, page 422 and Vol. II, No. 4, page 597 of the R.A.F. Quarterly.

“ Although the bombing formations drew to themselves much enemy air activity, it is remarkable that not a single raid was prevented by enemy action The reason, in part, was the determination with which the escorting pilots did their job, but chiefly the effectiveness with which the direct offensive against the German Air Force was waged.” (Vol. II, p. 259.)

The comparative immunity of the bombers in 1916 cannot therefore fairly be ascribed to the frustration of S.S.F. attack by the bombers' defensive fire power. During 1917 the policy of direct escort by fighters and of strong offensive patrols was continued, bomb raids or formation reconnaissances being co-ordinated with these patrols. An instance of what might occur to unescorted formations when the covering force of fighters is absent occurs in Vol. III of the Official History (p. 324), where it is described how two attempts at distant reconnaissance, in each case by six Sopwith two-seaters, resulted in the loss of seven aircraft, the reconnaissance remaining uncompleted. Again (p. 351), in April, 1917, a failure in co-ordination allowed a formation of six R.E.8s, unsupported by their own fighters, to meet six enemy S.S.Fs. All the R.E.8s were shot down.

When the Official History is so far completed as to cover the operations of the 41st Wing (Independent Force) some valuable data may be available, provided it is possible to allow for evasion and other special considerations, such as the lowered morale of Germany's pilots and her shortage of material. In the meantime the casualty statistics of January to September, 1918, show that the D.H.4 and D.H.9 Squadrons, *i.e.*, those carrying out the more distant formation raids and reconnaissances, had a higher rate of casualties from enemy action than any other type of Squadron. The number of pilots killed, died of wounds, or missing, for these Squadrons, averaged over 4.7 per Squadron month. As a comparison our R.E.8 and S.E.5 pilot losses for the same period were 2.5 and 3.5 per Squadron month respectively.

Such experience as we have does not therefore support the theory of the impotence of the S.S.F. The charge brought by Air-Commodore Chamier is, however, so serious, that an attempt should be made to evaluate the defensive fire power of a day bomber formation, and to compare it with the fire power of the S.S.F. Inevitably, much speculation will be involved. Purely as a basis, let us consider the attack of a nine single-engine bomber formation by one S.S.F. It is useless to compare the total number of guns on each side. The shortness of the range at which air firing is effective, the blind areas due to the structure of the aircraft, and of adjacent aircraft, the restricted arcs of fire caused by wind pressure, and the present impracticability of fire control, all combine to reduce materially the number

of guns that the bomber formation can usefully concentrate upon a S.S.F. which adopts sensible tactics when closing. The factors are very variable. In the case under consideration, the assumption that six movable guns could usefully be brought to bear probably favours the bombers. The present standard fighter armament being two guns, it would appear at first glance that the fighter is heavily outclassed.

The inferiority is, however, more apparent than real. The characteristics of the two types of machine gun must be taken into account. The air gunner has a movable gun in a non-rigid mounting. Both he and the gun are, in modern aircraft, subjected to great air pressure. The gunner must make allowance for his own and for his target's velocity, *i.e.*, he has a double deflection shot. All these circumstances are unfavourable to effective shooting. The S.S.F. pilot, on the other hand, has guns rigidly mounted integral with his aircraft. He aims from the comparative comfort of a sheltered cockpit, and has only to consider the velocity of his target, *i.e.*, he has a single deflection shot. He has, moreover, an engine in front of him, a parachute under him, and below that friendly country in this particular case of the attack of a bomber formation. All of these factors are conducive to peace of mind and accuracy of shooting. If the practical fighting efficiency of the fixed gun is assessed as twice that of the movable gun, the assumption again, probably, favours the day bomber. In our hypothetical case—one S.S.F. versus nine S.E. bombers—the real “fire odds” are therefore not 6 to 2, but of the order of 3 to 2 against the S.S.F. It is, therefore, practicable for fighters to realize by simultaneous attack—the tactics need not necessarily be complicated—a fire superiority sufficient to ensure bomber casualties, and the disintegration of the bomber formation. S.S.F. casualties will occur—omelettes and eggs—but the analysis shows that, if handled with common-sense and determination, their tactical position, *vis-a-vis* the bombers, should not be one of inferiority.

Although one may not agree with Air-Commodore Chamier's condemnation of the S.S.F., nevertheless it is of interest to examine the characteristics of the heavy fighter he proposes. In postulating that evasion be ignored, the kernel of the problem of defence against bombers has been avoided. The difficulty is fundamentally, not to endow the S.S.F. with reasonable offensive fire power, but to ensure that it makes and maintains contact with the bombers. For this, high speed and a fast rate of climb are essential, and in these respects the modern S.S.F. with comparatively light machine gun armament has no margin to spare. The weight of the shell-firing gun with 100 rounds is given by Air-Commodore Chamier as 500 lb. To this must be added the weight of the mounting and sights, of the additional

structure necessary to carry the gun and mounting, and to absorb the recoil. Blast effect with possible resultant local strengthening must also be considered, as must the size and weight of the ammunition container. It seems inevitable, therefore, that the performance of the heavy fighter would be such as to render it firstly, incapable of being intentionally at the right place at the right time, and secondly, unable, if by happy chance it found itself there, to maintain its position.

The problem of accurate long-range fire will, Air-Commodore Chamier believes, be solved by tracer shell "watched unerringly to the objective." Whilst admitting the well-known war experience that S.A.A. tracer misleads, he considers that a 12-oz. tracer shell would be satisfactory. The brain, particularly of a tired pilot flying high, is frequently incapable of accurately or instantaneously recording visual phenomena, and any form of tracer in air fighting is particularly deceptive owing to the range factor when the shot is a deflection one. For instance, a tracer, observed before it has reached the target, may appear to be going straight at it, when in fact it will pass behind, owing to the movement of the target across the path of the bullet or shell. Similarly a tracer observed beyond the target may appear to have passed behind, when in actual fact it passed ahead of the target. To give an accurate indication for air fighting, a tracer would have to "trace" only as it cuts the path of the target. Confirming these theoretical considerations, practical experience with tracer shell against air targets has shown it to be as misleading as S.A.A. Tracer. Accurate single-shot long-range firing is therefore unlikely to be feasible without some form of predictor to solve the problem of the "future position of the target," as in A.A. gunnery.

Air Commodore Chamier uses the analogy of naval weapons to support the case for the heavy fighter. But the path of analogy is full of pitfalls, and so revolutionary a change in material and tactics must be justified solely by its own merits. Since the review of past experience, and an examination of relative practical fire power do not lead us to condemn the present type of S.S.F. as being ineffective in face of the defensive fire power of day bomber formations, there appears no sound reason at present to develop an additional class of shell-firing fighter, particularly in view of its inevitably inferior performance, and the still unsolved problem of accurate long range fire. The offensive value of such an aircraft is problematical, but its fate, if surprised by S.S.Fs., or even fast bombers without a bomb load, leaves little to the imagination.

THE ROMANCE OF A CAMERA

BY A. J. INSALL (LATE R.A.F.).

How much one science owes to another in this forgetful world of ours few of us pause to consider. One example of this indebtedness has just been brought home to the writer, by a chance meeting with an old friend, from whom he was fortunate enough to obtain the romantic story of the first British-built air camera. In the same way that the huge strides in wireless development, following the military use of wireless telegraphy for artillery observation during the period 1914-1918, gave birth to the domestic wireless set in the form in which it is known to-day, so, in photography, if it had not been for the fillip received during the war, from aviation, our favourite morning newspaper would not to-day draw such exclamations of admiration when opened at the page where the photographs are. Air photography in the war had its share in the making of the photographic lens of modern times, if only because of the tremendous impetus it gave to the manufacture of this peculiarly simple-looking little component, and we know from recent utterances on the subject how great has been the post-war success of the British-made product. The applications of air photography itself have, moreover, been extended during recent years, as all who have followed the subject at all closely know, and in such branches of science as topography and archæology the aeroplane camera now plays a very important rôle. The making of the first British air camera, therefore, has some claim to attention to-day, quite apart from the unusual circumstances surrounding it.

In the second month of the war, officers of the Royal Flying Corps in France had secured photographs of certain of the enemy's positions, but the results, if not wholly discouraging, were very far from perfect. An experimental section was formed at the end of the year to place "aerial photography" on a sounder footing, and, with infinite patience and very considerable skill, this little band of pioneers, which included at its head Lieuts. J. T. C. Moore-Brabazon and the late C. D. M. Campbell, strove towards that difficult goal—the design of a camera suited to the requirements of air photography. That an inkling of what was needed was soon obtained will be seen presently, but at that date the only suitable apparatus available for experiment was a rather battered camera of the "Press Camera" type. In the

first two months of the following year photographs of such evident promise were secured, notably of enemy trenches near the La Bassée Canal, that the Field-Marshal Commanding-in-Chief was persuaded of the value of air photography for the conduct of military operations, and ordered every effort to be made to produce the necessary equipment. Thus backed, the Royal Flying Corps got straight to work, and two officers (Lieuts. Moore-Brabazon and Campbell) were dispatched post-haste back to England, under instructions to do or to die. The capture of the Cuinchy Brickstacks, with many prisoners, following the examination of excellent photographs of the enemy position taken by officers of No. 3 Squadron, Royal Flying Corps, had laid the foundation of air photography on firm soil, and there was no knowing what far-reaching results a rapid development of the new science might have.

One Friday forenoon in February, 1915, Mr. Richard Hesketh, Secretary of the Thornton-Pickard Photographic Manufacturing Company, was in his office at Altrincham, Cheshire, when news was brought in to him of a mysterious and urgent trunk call that had just come through from London. "Military officers are on the line," he was told, "inquiring about focal-plane shutters, and demanding the immediate attendance of a responsible representative at the War Office." A simple action appeared to Mr. Hesketh to be called for. He put on his overcoat and hat, packed his suitcase, and caught the next train to town. On arrival, shortly after midnight, he snatched a few hours' sleep, breakfasted, and repaired to the address given him, Lieut. Moore-Brabazon's town house in Queen's Gate, W. Here, in the company of Lieut. C. D. M. Campbell, he and Moore-Brabazon started a roundabout conversation that at the end of an hour brought them back to their starting-point. At first sight this may appear absurd, but it must be remembered that England had not long been at war, and that the discussion of military affairs in the presence of any civilian at this stage was fraught with many obstacles, and here was a subject that involved the handling of information of a highly secret nature. At the end of the first hour's talk it became patent to all three, that, for anything to come of the discussion, military tradition would have to be broken and the civilian member of the gathering taken into complete confidence. Accordingly, the barriers were thrown down, and the conundrum facing the Royal Flying Corps in the field was laid bare. A fruitful second hour and an additional twenty minutes were now spent over a sheet of foolscap, whereon, as the discussion proceeded, took form and outline the tapering box-type apparatus shortly to be known as the "A" Camera of the Royal Flying Corps. All the essential points and parts of the camera were decided upon,

down to the actual positioning near the top of the two leather straps by which it would be held during operation, and the tensioning device of the focal-plane shutter spring, and when, shortly after midday, Mr. Hesketh and Lieut. Campbell took leave of Lieut. Moore-Brabazon, the "A" type camera was to all intents and purposes in existence.

A hurried lunch at Simpson's in the Strand at Lieut. Campbell's expense gave time for a telegram to be dispatched to Altrincham asking for two Works' foremen to be at Mr. Hesketh's home address and a motor at the station on his arrival. Met by Mr. Thornton-Pickard, the Secretary so outlined the undertaking he had shouldered that by the time they reached his house all that was necessary was to explain what was required to the foremen, and give the appropriate instructions for the sundry "outside" work (such as brass angle-plates and fittings). Until early dawn, four men sat excitedly discussing the pros and cons of the rapid translation of these ideas into a camera which was to be the pioneer of such amazing photography as had never yet been dreamt of. Then, tired and exhausted, Richard Hesketh crept to bed. Younger men than he might justifiably have left the matter there. But at midday (Sunday) he was in his office examining the completed wooden carcase of the camera, and, sad to relate, fiercely admonishing an over-zealous operative through whose desire for lightness the thickness of the wood had been reduced from $\frac{5}{8}$ inch to $\frac{1}{4}$ inch. Condemned out of hand, the precious box went back to be re-made, and Mr. Hesketh turned his attention to the progress of the various other parts. Monday came and went, and Tuesday. On Wednesday, Lieut. Moore-Brabazon walked into the Works' office and was presented with a completed camera.

High-speed work such as this requires no commentary, even though the production of this instrument may well constitute a record for quickness. We would really prefer to leave the story here, but fairness to all parties concerned compels us to add to it. Almost as soon as the camera was handed to him, Lieut. Moore-Brabazon discovered two slight modifications in the original design, one in the winding mechanism of the shutter and the other in the positioning of the leather hand-grips—again because one in "authority" thought he knew the needs of experts better than they. These two little alterations put the work back two days, and delivery of the first "A" Camera could not be made until the Saturday following the historic meeting in Queen's Gate. But on that date it was duly handed over and rushed out to France, where, on March 2nd, it was taken over the enemy's lines and used for the first time in the air, a 5 x 4 plate being exposed above the village of Fauquissart by an observer of No. 3 Squadron.

SOME DEVELOPMENTS IN IGNITION AND STARTING

BY E. L. MAYALL EMTAGE, A.M.I.E.E., A.M.I.Mech.E.,
A.M.I.A.E.

(Continued from page 610, Vol. II., No. 4.)

SINCE the first part of this article went to press a new air speed record has been established by Flight-Lieut. Stainforth, A.F.C., and the remarks with regard to sparking plugs and magnetos used in the previous record do not apply in this case.

The magnetos used in this case were of the Watford S.P.12 type, of the same basic type as that shown in Fig. 4* but unscreened.

The sparking plugs were of the Lodge X237 pattern generally similar to that shown at Fig. 12* but designed to withstand rather more heat.

Starting.

The starting of aero engines can be classified under :—

- (a) Hand-starting.
- (b) Self-starting.

It is assured that normal hand-starting, by airscrew swinging, is well known and also that the developments of that type of starting by Huck's Starter and hand-turning gear do not need description.

It is proposed to deal with a few modern types of self-starting only.

Gas Starting.

The original R.A.E. Mk. 1 Gas Starter which has been developed successfully by Messrs. The Bristol Aeroplane Co., consists of a small single cylinder two-stroke engine which operates a pumping cylinder off the same crank pin. The general arrangement is shown at Fig. 14.

The pumping cylinder draws mixture from a small carburettor and delivers it to the aero-engine cylinders in turn through a rotating gas distributing valve, which turns at half engine speed. There are non-return valves, through which the mixture passes, in each cylinder of the main engine, and also in the head of the compressor.

The starter is fitted with a two-cylinder magneto, one terminal of which fires the starter cylinder, while the other supplies the starting magneto terminal of one of the magnetos on the engine to be started.

* See Vol. II, No. 4, opposite pages 606 and 608.

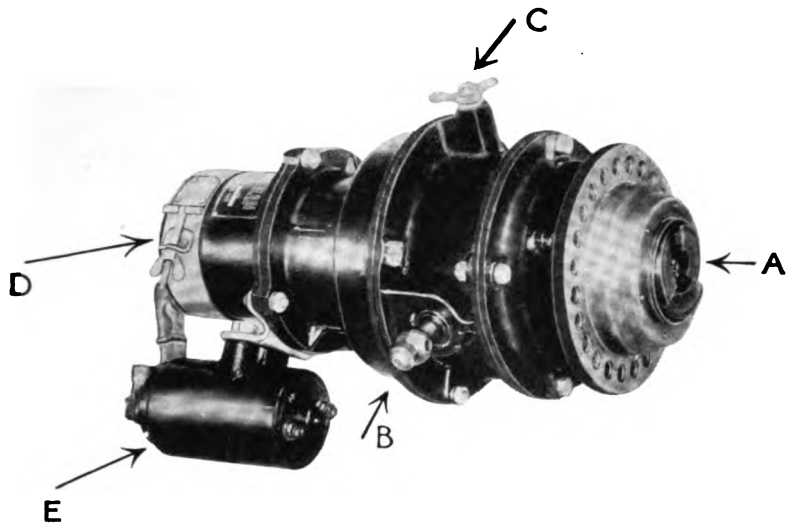


Fig. XIX.—Series VI Electrically energized Eclipse Inertia Starter.

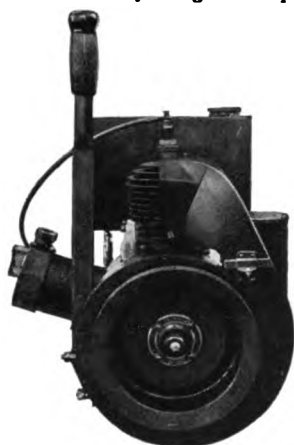


Fig. XIV.—Bristol Gas Starter.

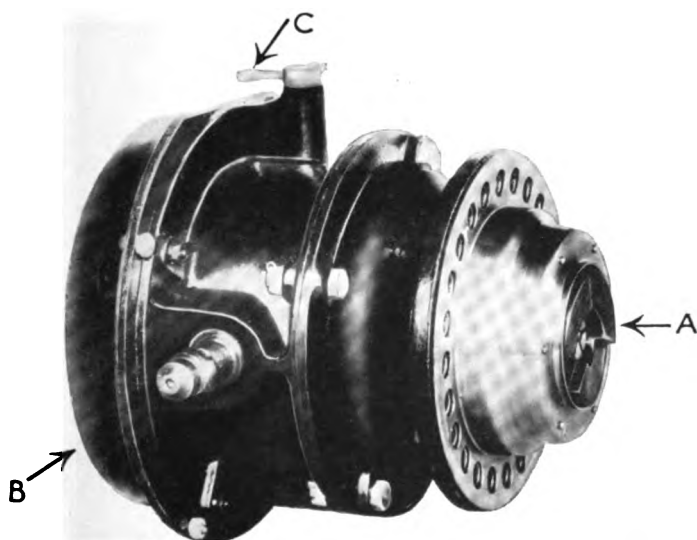
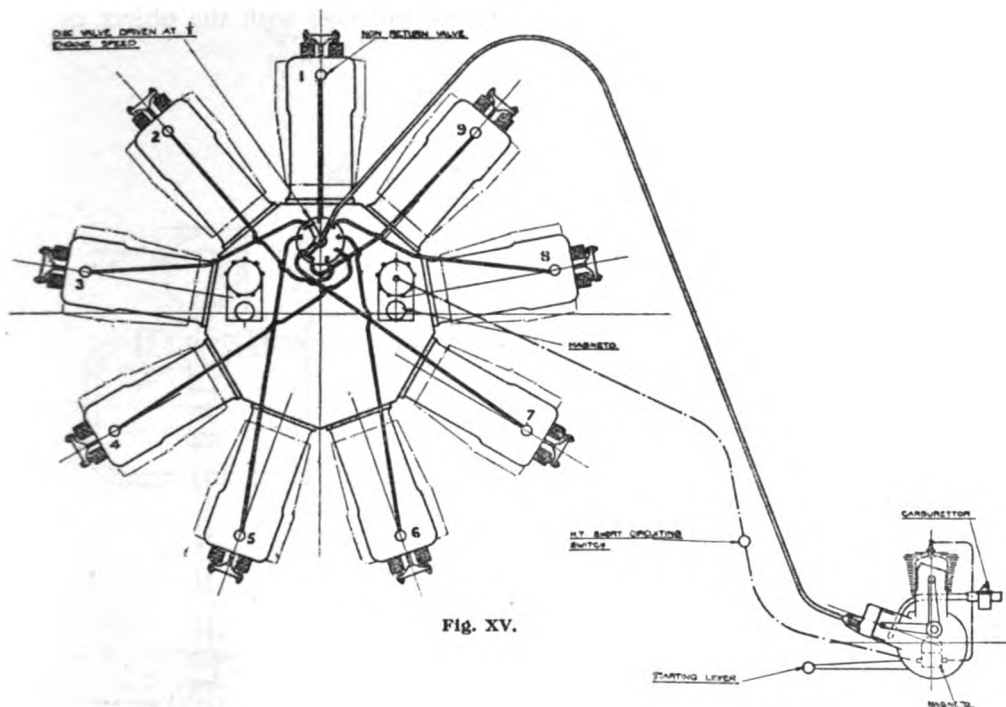


Fig. XVIII.—Series VI Hand energized Eclipse Inertia Starter.

Fig. 15 shows the general arrangement of the starter as applied to a "Jupiter" engine.

The pumping cylinder carburettor is set to give a richer mixture than normal so as to compensate for subsequent dilution in pipeline and cylinders, and possible loss by precipitation.

The starter not only supplies combustible mixture to the cylinders under a pressure of from 80—140 lb. per square inch but ensures satisfactory ignition from its two-cylinder magneto which is rotating at high speed.



The gas distributor which is shown in Fig. 15 consists of a disc valve rotating at half engine speed and registering with the ports corresponding to the various engine cylinders in turn. It not only supplies gas to each cylinder on its firing stroke but also discharges mixture for priming purposes during the induction stroke.

The compressed mixture is capable of turning the aero engine over even before ignition takes place, and can under suitable conditions turn an engine of 500 h.p. at a speed of 15 r.p.m. This has the advantage that the moving parts of the engine are actually in motion when the mixture is fired, and the oil films which cause "gumming" of the parts are already broken down.

This type of starter has been used principally on aerodromes for

E

ground starting, the starter being fitted to a trolley which can be wheeled up to the aircraft and connected to the engine by a flexible mixture hose and H.T. plug connection. It has been installed on certain multi-engined aircraft for some years and is provided with a belt pulley for driving auxiliaries. It weighs approximately 50 lb. without piping and distributor, which is considered prohibitive for smaller aircraft.

R.A.E. Mk. II Starter.

With a view to obtaining more positive starting, particularly with engines which are not in new condition, and also with the object of

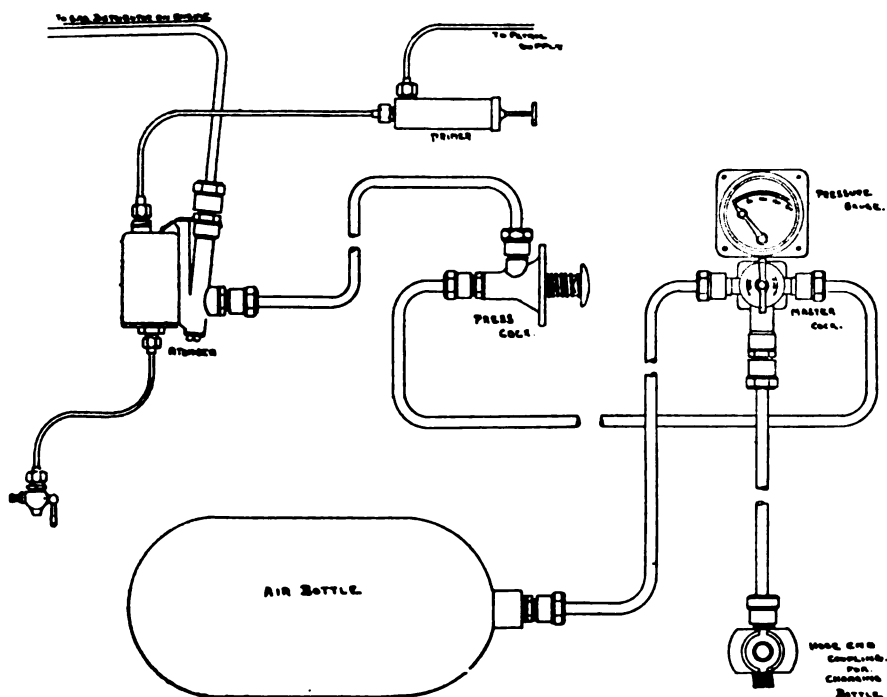


FIG. XVI.

producing a light starter which could be carried on normal types of fighting aircraft, the R.A.E. Mk. II Starter was developed from the Mk. I Starter.

This Starter is essentially the same in basic principle but a higher working pressure of 200 lb. per square inch is used, so as to turn the engine faster and leave a bigger margin for leaky valves and piston rings. In this case the supply of compressed air is carried in a light bottle of about 400 cubic inches (free air) capacity. This bottle is charged with air to 200 lb. per square inch on the ground, either by

a Bristol two-stroke compressor, modified for this pressure, or by hand- or foot-operated pump in emergency.

Each bottle carries sufficient air for four or five starts of a normal engine of 500 h.p. and is approximately 5in. diameter and 22in. long.

Ignition with this starter is by means of a normal hand-starting magneto.

From Fig. 16 it will be seen that the connection to the bottle is con-

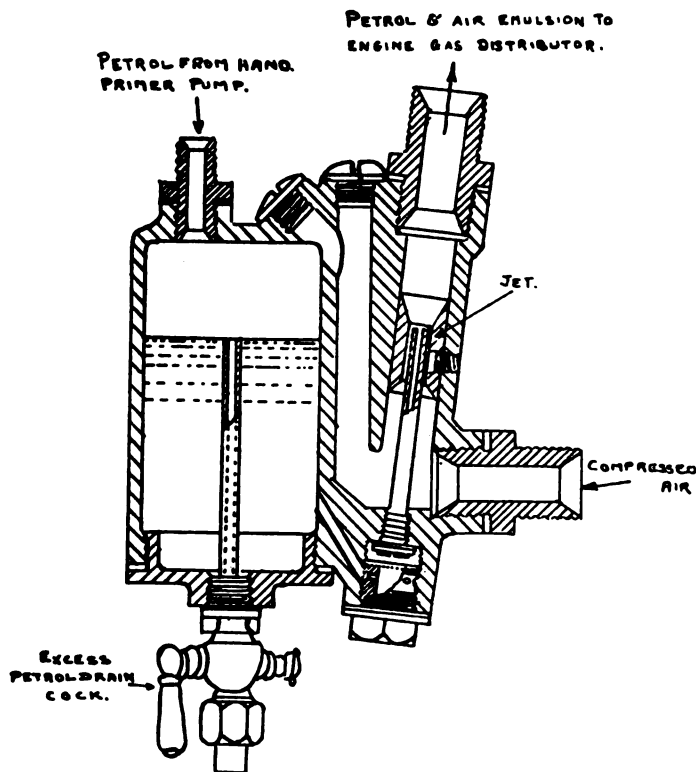


Fig. XVII.

trolled by a master cock (situated in the cock pit) which has three positions, " Off " ; to the presscock for starting ; and to the hose connection at the side of the aircraft for recharging.

To start the engine, the master cock is turned on to feed the presscock which is a spring-loaded valve similar in appearance to the starter pedal on an automobile. When this cock is depressed a blast of air is admitted to the atomizer, which is in effect a small carburettor. This is shown at Fig. 17. It will be observed that there is no float chamber mechanism, the corresponding space being occupied by a small reservoir

with stand pipe. When the reservoir is filled up to the level of the stand pipe it holds the correct quantity of fuel for starting.

The airblast picks up the correct quantity of fuel from the atomizer and the resulting mixture is distributed to the appropriate cylinders in rotation through the gas distributing valve on the engine and the non-return valve in the cylinders.

In this case the gas distributing valve has no priming port, mixture is only delivered direct to the cylinders on the firing stroke.

This starter weighs only 12-18 lb. (depending upon the type of air bottle used) for a single-engined aircraft while in the case of multi-engined aircraft it is not necessary to add a complete set of starter fittings for each engine, because mixture and H.T. current can be distributed to each engine in turn by means of combined H.T. and gas distributors under the pilot's control.

The advantages of this type of starter are its light weight and quick positive action. With a fully charged bottle it is possible to obtain four or five starts of an engine of 500 h.p. away from the aerodrome. It has been used successfully on racing engines both in the air and in *Miss England II* without any detriment to the performance of the engine.

There are many proprietary gas starters working on the same principle but with variations of pressure and timing, such as the American Heywood Starter and the French Saintin, Herzmark, and Viet Starters.

Cartridge Starters.

The Cartridge Starter, while not truly a gas starter, utilizes the force of gas pressure on a piston in the engine to rotate the engine at such a speed that it will start from its own carburettor and ignition systems.

The *Farman Cartridge Starter* is used considerably on the Continent and in this country on the Continental air lines. It consists essentially of a small pistol or firing chamber fitted with a bolt action breech mechanism. The chamber takes a 12-bore blank cartridge similar in appearance to blank sporting ammunition. The powder used is a special powder burning at such a speed as to give a propellant action to the piston rather than a blow. The firing chamber is connected by a pipe-line to one cylinder of the engine into which it discharges through a spring-loaded non-return valve.

The operation of starting is carried out by turning the engine over until the correct piston comes to just over top dead centre on the firing stroke. The cartridge is then inserted in the firing chamber, breech closed, and the trigger pulled. This can be done by a wire control from the pilot's seat.

The starter is probably the lightest engine starter, weighing only about 4 to 5 lb., for a 500 h.p. engine, while the ammunition is easily

stowed and thus permits of a very large number of starts away from the aerodrome. It is also very positive in action and reliable. It rotates the engine over several revolutions at high speed and the gases from the cartridge do not apparently have any deleterious effect on the engine. It is, however, essential to turn the engine over to get the correct piston into position for starting and to have means of ascertaining readily when this is so.

The Inertia Starter.

This type of starter consists of a small fly-wheel which can be accelerated up to a high speed (12,000 r.p.m.) through suitable gearing operated by hand or by electric motor.

The energy thus stored in the fly-wheel is applied to the engine crankshaft through a multiple reduction gear, torque overload release or slipping clutch, which is set so that it will just slip if the engine backfires, and a driving dog clutch which engages with corresponding dogs on the rear of the engine crankshaft.

Fig. 18 shows a series VI Eclipse Inertia Starter arranged for hand operation only. This model is used on Armstrong Siddeley "Lynx" engines and engines of similar power. The illustration shows the dogs "A" which engage with the crankshaft end, the socket for the crank handle for hand energizing "B," and the operating lever "C" for engaging the starter dogs with the crankshaft dogs.

Fig. 19 shows the same type of starter with electric motor "D" and solenoid switch "E" for electric energizing. This arrangement enables the pilot to restart the engine in the air or on the ground from his seat. The electrical energy is taken from a 12-volt battery which may be carried on the aircraft, or brought out to the aircraft on an aerodrome trolley if only ground starting can be provided for.

The solenoid switch provides remote control from the pilot's cockpit where a push-and-pull switch operates the solenoid switch on the starter. By pushing the switch button in, the solenoid circuit is closed and the motor accelerates the fly-wheel to operating speed. When this speed has been attained (usually in five seconds) the switch button is pulled out to switch off the motor, and pulled out further still to operate the lever "C" on the starter to engage the starter dogs "A" with the crankshaft dogs. In this case the control is by cable or rod and not electrical. As soon as the engine fires the button is released to its normal "off" position.

The electric motor is only engaged with the fly-wheel while it is energizing the fly-wheel, this is arranged by means of a dog clutch running on a quick pitch square thread similar to the thread on the Bendix gear of an automobile electric starter. As soon as the fly-wheel is up to operating speed the drive is automatically disconnected so that

no energy is absorbed in motor brush friction, armature windage, or mechanical losses. This is also the case when hand energizing is used, thereby avoiding unnecessary effort being expended. A special battery has been developed for use with the electrically energized starter. This battery has to withstand discharges of about 400 amperes at the instant of switching on falling rapidly to 60 or 80 amperes during the five seconds that energizing occupies. The battery normally used in the U.S.A. for this purpose weighs approximately 35 lb. and will energize a starter twenty times between charges.

The electrically energized starter has the great advantage over the hand energized type that it is much quicker in operation and permits of starting from the pilot's seat. The hand energized type requires from 15 to 20 seconds of rather strenuous turning, up to a speed of about 80 r.p.m. In either case, however, three or four starts can be obtained from a single energizing with experience.

Reference to Fig. 6 in the previous instalment of this article—October issue—shows the Series V Eclipse hand energized Inertia Starter fitted to the Bristol Mercury V Engine.

This starter weighs approximately 34 lb. with crank handle and fixing bolts.

This type of starter requires the engine to be built to take it and occasionally necessitates small modifications of the aircraft such as recessing the bulkhead to clear the starter. It is, however, extremely effective even in the coldest climates. It is in very considerable use in the United States and in Canada and was used by Commander Byrd in his Antarctic expedition, where it was quite satisfactory.

A very neat hand energized Inertia Starter similar in design to the Eclipse Starter has recently been produced in France by the Viet Company.

Herzmark Compressed Air Starter.

This starter which was originally designed for automobile and stationary engines has recently been the subject of development for aircraft engines on the Continent and in the U.S.A. as well as in this country.

It consists essentially of a closed cylinder ("A"), Fig. 20, in which two pistons ("B" and "C") are placed face to face. These pistons are connected together by means of a multiple quick pitch screw thread. The male thread ("D") is cut on a stem affixed to the piston ("B") while the female thread is carried on the other piston ("C"). The effect being that the two pistons are in the same relation to one another as a nut and bolt.

The piston corresponding to the bolt ("B") carries dogs ("E") which can engage with dogs on the crankshaft-end and the teeth of the dogs are so cut that they automatically disengage when the engine starts.

The two pistons are normally held close together by means of a strong internal tension spring (" F "). Compressed air can be released through a port (" G ") between them and this forces them apart. The piston (" C ") is checked by spring-loaded ball plungers (" H ") to prevent its moving, before the piston (" B ") can move up to the

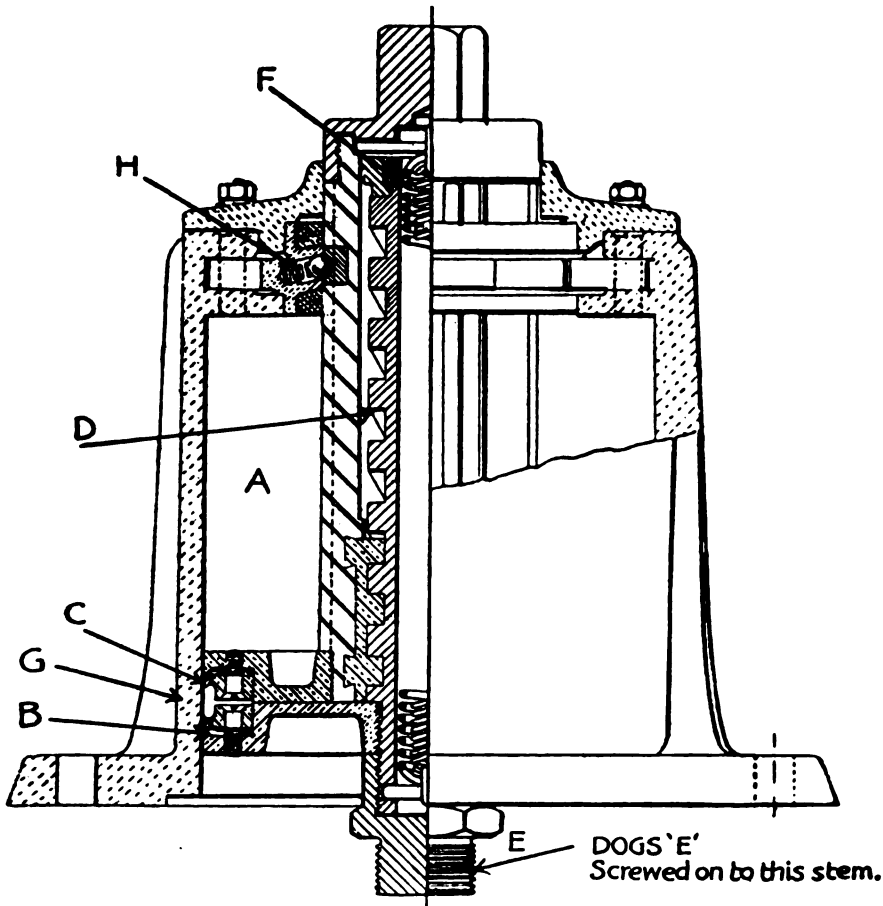


Fig. XX.—Herzmark Compressed Air Starter.

crankshaft and engage the dogs. When the dogs are engaged the piston (" C ") only, is free to move along the cylinder but is checked from rotating, while the piston (" B ") engaged with the crankshaft can rotate but cannot move axially under the air pressure, because it is already in contact with the crankshaft. As the air pressure forces the two pistons apart the multiple thread causes the piston (" B ") to rotate and in so doing rotates the crankshaft.

The threads in the starter usually provide for turning the engine over about 1.1 revolutions, but as the engine is accelerated up to between 500 and 600 r.p.m. the inertia of the moving parts and of the airscrew carry it on for two or three further revolutions during which time the magnetos and carburettors are able to come into operation.

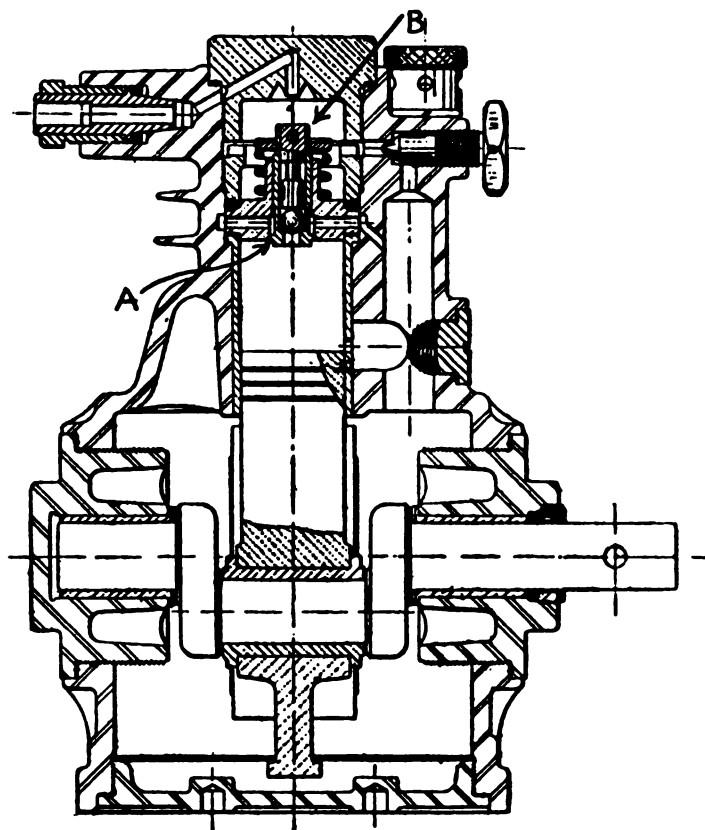


Fig. XXI.—Hersmark Compressor.

The compressed air supply is carried in a bottle which is charged to 500 lb. per square inch by means of an automatic engine-driven compressor (Fig. 21), which has a cut-out valve ("A") in the head, which is set to open as soon as the pressure in the bottle is raised to normal. After the cut-out valve opens the compressor ceases to pump, and merely idles, until a fall in pressure permits the valve to close.

The compressor is cooled by circulation of oil from the air bottle to the compressor head ("B"). About a pint of oil is placed in the

air bottle and the air delivery pipe from the compressor is submerged in it so that all air delivered to the bottle expands through the oil, thereby chilling it. The oil, however, is allowed to circulate back to the compressor head where there is a heat exchange between the cold oil and the compressor head. The large quantity of oil used in the bottle

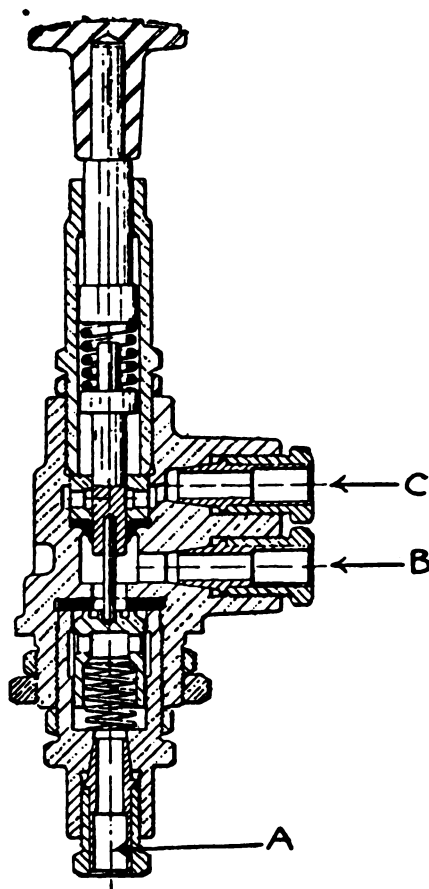


Fig. XXII.—Pedal for operating Herzmark Starter.

prevents any tendency to combustion within the bottle while it is claimed that the expansion of the air through the oil cleans it and removes water and oil vapour carried in suspension.

The air supply from the bottle to the starter is controlled by a light pedal, Fig. 22, which has three ports, one of which (" A ") is connected to the bottle, the second (" B ") to the starter and the third (" C ") is open to atmosphere.

The first movement of the pedal allows a very small quantity of air to pass to the starter. This is sufficient to cause the inner piston to move back and engage with the crankshaft while it allows the air pressure to be balanced on either side of the main air valve, which in consequence is easier to open when the pedal is further depressed.

When the starter has been operated no air can escape until the pedal is released, when the air in the starter is exhausted to atmosphere through the third port ("C") in the pedal. There being only one air port ("G"), Fig. 20, to the starter, air must enter and leave by the same pipe to the pedal and this prevents air being used except in definite attempts to start the engine.

The usual working pressure of the starter is between 500 lb. per square inch and 200 lb. per square inch. As these pressures are too high for hand- or foot-pumping the engine driven compressor is essential, but the inventor has devised a scheme for using a cartridge in emergency to operate the starter.

This starter having few working parts can be made light. A starter for a standard 500 h.p. engine weighs from 10 to 12 lb. while the compressor weighs less than 4 lb.

As in the case of the Inertia Starter the engine has to be built to take the starter.

It is simple, easy of adjustment and very smooth and effective in operation, but the screw threads have to be most carefully made and hardened.

General.

The ideal starter for aero engines should be:—

- (1) Under 10 lb. in weight for a 500 h.p. engine.
- (2) Entirely self-contained.
- (3) Easily operated by the pilot from his seat and without turning the engine over by hand.
- (4) Of such design and dimensions that the standard engine and aircraft will take it without serious alteration.
- (5) Instantaneous in operation.
- (6) Smooth in action, without causing shock to the engine or any of its components.
- (7) Reliable and easy to maintain.
- (8) Easy and cheap to manufacture with as few working parts as possible.

The types briefly described each have some of these points in their favour, but none as yet can claim to approach the ideal.

(Concluded.)

THE WASSERKUPPE, 1931

By

B. F. HAYTHORNTHWAITE.

INTRODUCTION.

Ten years ago the first soaring flight of an hour was made; ever since then, though other countries have remained comparatively inactive, Germany has consistently advanced in the art of soaring flight.

Each year competitions have been held and an increasing amount has been distributed in prizes. Each year definite progress has been achieved and now Germany occupies a pre-eminent position and the annual meetings attract visitors from all over the world.

This year the contests were unusually interesting. The Wasserkuppe is almost as high as the highest mountain in England yet 40,000 people gathered near the summit to watch some of the events.

Such has been the advance in design since 1930 that the merest beginners almost succeeded in equalling the achievements of last year's champions.

OUR ARRIVAL.

The road wound and struggled against the hill and the passengers swayed in their seats. A vast thunderstorm was coming up from the West, and as if conscious of its approach whole families of peasants worked feverishly at the hay in the little sloping fields of the valley. A mountain stream brawled among the boulders in gaunt banks eloquent of the torrents of spring. The yellow bus swung out over a narrow stone bridge and seemed to take the bit in its teeth for the last long pull to the summit.

The view became wilder in every direction. Through veils of rain distant ranges of hills suggested a vast panorama, while the storm became so menacing that we all longed to get under cover. The summit was surmounted by plantations of young fir trees and there were grey-brown wooden huts and sheds.

At first I confess the mixture of mud and stone, the wind, and the tremendous storm which seemed to be hanging directly above us drove all thoughts save those of shelter from my mind. There was a large and rambling, three-storeyed, wooden house, covering so much ground on the open hill-side that you scarcely realized its height. In this we sought shelter for the night.

No one knew us, and the fact that we were unexpected acquired a peculiar significance as the storm drove us to seek shelter. Everyone seemed to be entirely preoccupied and it took me a little while to realize the reason. It was just that everyone was absorbed in talking about the one subject, the subject of soaring flight.

The storm would have occupied a good deal of attention anywhere else; here it was of secondary interest. Again it took me some time to realize the reason. Even this tremendous thunderstorm was only of interest in so much as it might serve as a tidal wave of air on which the most intrepid soaring pilots might succeed in surf riding into the distance. The excitement of this idea was certainly enough to occupy everyone's attention.

In the crowded, smoke-laden dining-room we were lucky to secure seats. Through the windows, on three sides of the room, the ferocious skies gathered and glowered until I felt that when the storm broke we would all be swept away.

From the low ceiling there hung delicate little models of the graceful sail-planes of 1931. Everywhere eager faces poured out a babble of incomprehensible German while the one pale waiter hovered ineffectually as if battered with bewilderment by the sheer weight of orders fired at him from every side.

It seemed a long time before tea was set in front of us, accompanied by a slab of palæolithic pastry. But it was not long before the spirit of the place took hold of us and we became embroiled in aeronautical discussions with an interesting American pilot. And, indeed, during the whole of the rest of our visit, I can hardly remember one half-hour in which we were not either meeting someone new or on our way to some fresh discussion on the matters which interested us all so much.

THE PEOPLE.

Nor need it be imagined that the society of the Wasserkuppe is exclusive. Far from it, the ordinary tourist comes and goes and I am sure is not made to feel ill at ease, only amused, by the discussions with which he finds himself surrounded. There is a wonderful absence of formality, a wide freedom of action and variety of character, accompanied by the most pronounced differences of dress. And binding all together you realize, after a little while, the most extraordinary enthusiasm for the new art—soaring flight.

It would be difficult to imagine anything more refreshing or any contrast more pronounced. In England we all try to conform to the same uniform standard of appearance, although, in thought the widest diversity of interests provokes no comment. You may talk about

making billiard balls out of whales' teeth, no one will pay much attention, but you might be arrested if you wore shorts in Bond Street! Here on the Wasserkuppe it was just the other way round. Differences in appearance might go hang; even nationalities were ignored but the one pervading interest bound us all together.

So for the stranger, when he first arrives, the Wasserkuppe is highly confusing. He may even imagine himself to be walking in a dream, surrounded by a collection of varied and very animated ghosts. But this impression soon changes. The spirit of the place takes possession of him, until in the end he may even learn to recognize newcomers, and almost without a pang, the same expression of cheerful perplexity that not so long ago he bore himself.

Next morning a gentle breeze stirred through the fragrance of the pine trees and the vista was beautiful beyond description.

On the open hill-side a yellow aeroplane was started and flown away with as little ceremony as would be necessary to turn on a tap. It was the Meteorological machine, its struts were cobwebbed with instruments and long after it was gone into the immeasurable distance of the sky its note continued to filter down through the silence of the sunrise.

It was not long before the siren sounded. I set out for the summit and came on a team handling a peculiar, tail-less glider, like some immense bat, bleached white in the sunshine. They were in the act of lifting it on to a trolley. I joined in and helped to push it up the long grassy hill, and was accepted as tacitly as though I was a member of the team itself.

On the very summit there was an enclosure loosely roped off for the general public, and the windward slope was reserved for the sail-planes, the pilots and the teams. Here the official committee set up their instruments, range-finders, telescopes, and anemometers with which to observe the day's flights.

Presently careful men arrived and settled themselves motionless and intent on their observations. Round them the wind, the clouds, the very day itself seemed to flow silently by. Time acquired a new significance. It was not in the past that they were interested, nor in the moment. Like the bowsprit of a slowly moving ship they pointed ever forwards over the immediate future.

Among the crews and the pilots you could see that there had grown up a strong weather sense. Faces were vigilant and narrowed eyes ranged the distant horizon. They were like birds poised for flight, alert to the least change of direction or humour of the wind.

Every now and then one or another decided to take flight. He had only to step into his tiny cockpit and shut himself in up to the chin. Friends held his wing-tips. A group of half-a-dozen stretched them-

selves on their faces clinging, like the tail of a comet to each other, and ultimately to the two stalwarts who held back the tail itself.

There was a little bent spike pointing downwards under the front of each sail-plane, and on to it two elastic ropes were hooked so that they would drop off once the pull was released. On each rope a team of six or eight men gathered ready to stretch the elastic, like a living catapult, down the slope.

When the teams were ready the pilot would take command and shout to them, "Walk." Off they would go towards the crest of the slope; "run" and away they would go down the slope. Still the living anchor clung desperately to the tail. In a few seconds the strain of the elastic was enough, and on the shout, "release," the long-suffering anchor would relax and with a swirling rush the sail-plane rises into the air.

Every now and then the silence was broken as one or another machine took flight, and for a moment everyone's attention would be diverted, the teams walked, then ran, and with a shout yet another bird rose.

I had never realized how uninteresting flying must be to the stone deaf until I saw a whole flock of silent sail-planes hovering together in the sky. Everything seemed to be all wrong. Yet it was only the hum of the engines that was missing.

I can well imagine for this reason the horror which flying must have for the blind, especially where aerobatics are concerned. For it may be at the climax of some tremendous roar that the engine is suddenly shut off and there is nothing in the sudden and dramatic silence to tell the blind man if the machine is still safely circling in the sky.

THE PLACE.

The view from the slopes of the Wasserkuppe is very beautiful on a clear day. We were at the top of an immense grassy hill, the highest of its kind in the whole range. All round us the earth was heaped and hummocked in motionless waves of green, dappled with dark, fir plantations; and this stretched as far as the eye could see in every direction. Not only was the scene of a passive beauty to the spectators, it became the background to a picture of living interest. Hardly had the eye ranged into the middle distance before another exquisite sail-plane would go up with the sound of a shout, hang an instant on the top of its first swirling rush and set off to sail upon the streams of air.

The sky itself would then acquire a new meaning, for it was full of invisible currents. At the summit, of course, the whole wind was

turned upwards by the hill itself, like the water of a river swirling over a boulder.

Once beyond this friendly zone the pilot must glide into the unknown. If he has sensitive instruments they will soon tell him when he has the luck to meet a warm rising current (or "thermal"), where he can circle and climb.

That morning one sail-plane after another set off to explore for "thermals" without success. There was an escarpment down the hill, whose abrupt slope gave false promise of a deflected up-current. One pilot after another tried his skill, and one after another landed, till the meadow above the slope was dotted with motionless machines waiting to be retrieved.

All this while the older pilots sat and watched intently, trying to gain experience by the mistakes of the more impatient beginners.

At last one of them started. There was no difference in the look of his machine, possibly it flew more steadily than the others and gained height slightly all the way to its destination, but the difference was only trivial.

There the same struggle began again. This time the contest lasted much longer. Time and again he would come down low, so low that you would think that he was going to land. But each time he turned, certain that at least in that direction, no helpful current was to be found, and succeeded in regaining height after his costly venture into the unknown.

The effort of concentration is continuous. Through the whole flight the pilot must watch his instruments and at the same time try to map out his position above the ground. All the time he must use to the best advantage the sensitive long wings by soaring as closely as possible to a point of danger—the stalling point.

It was like watching a man on a slope of sand trying to climb. He would get so far and then slide back again. Only here the man was climbing the invisible slopes of the wind and in danger that if he was clumsy he might topple, swoop or spin into the ground.

But at last he began unmistakably to gain in a new direction, and even as you watched, he started to climb in a slow and effortless spiral. He had found a "thermal," a flue of warm air rushing up into the vault of heaven. How long would he hold it?

In five minutes he was far away down the wind, much higher, and even difficult to see in the cloudless sky.

In a few more minutes he was gone.

SURF-RIDING THUNDER.

The next morning the sky was like a snowdrift scattered into fragments by some invisible power. White clouds were torn into

fragments and driven like flocks of frightened sheep, surging masses of darkness came chasing them from the horizon. It looked like rain. And yet through this tempestuous sky the sun came out and shone down on the grassy slopes of the Wasserkuppe, and it developed into a warm, windless day.

It was certainly no weather for the soaring pilots of Germany. They wanted a really windy sky where clumps of clouds betrayed strong up-currents to their experienced eyes. The rare North-East wind would have been the wind of their choice, probably full of strong up-currents. It would have opened up unexplored ranges of mountains, and given scope for great distances. But there was no wind.

All the morning the younger pilots hovered to and fro over the near slopes on the calm air. But this sort of pottering held no attractions for the masters. They longed to explore unknown dangers far from port and map, the uncharted oceans of the sky.

That very morning some unconscious young prophet had sung as he shaved:—

“ Oh for the wings, for the wings of a squall,
Far away, far away would I fly,”

and now young and old chafed with the impatience of forced inactivity whilst they waited for the only welcome release from such weather—a real line-squall. This would come creeping along like a lamb and then develop into a madly driving thunderstorm, as it rose into the mountains.

Any power-pilot would try to avoid a thunderstorm and fly round it, but the soaring pilot seems to court disaster. He tries to surf-ride upon its very crest. Anyone would think his fragile sail-plane, with its slender wings, would be torn to pieces. He may be absolutely surrounded by thunder and lightning. Yet, as a matter of fact it may not even ruffle his hair, and if he is skilful he will be swept on the rising wind in front of the storm, far into the distance.

In the afternoon the word ran like fire through the whole camp, “ A line-squall is coming.” Everything was dropped. The siren screamed its warning and all hands ran to the sheds. In the utmost excitement the big, slender birds were withdrawn. It was a desperate race against time and even with every man working his hardest it seemed that the storm would win. For the line-squall now driving furiously down the heavens was already close at hand, announcing itself by a pitch black sky in the West. In the gloom “ Milseburg ” (the giant of the Rhon) towered like Kilimanjaro out of the plain, while the whole of the valley was plunged into complete darkness.

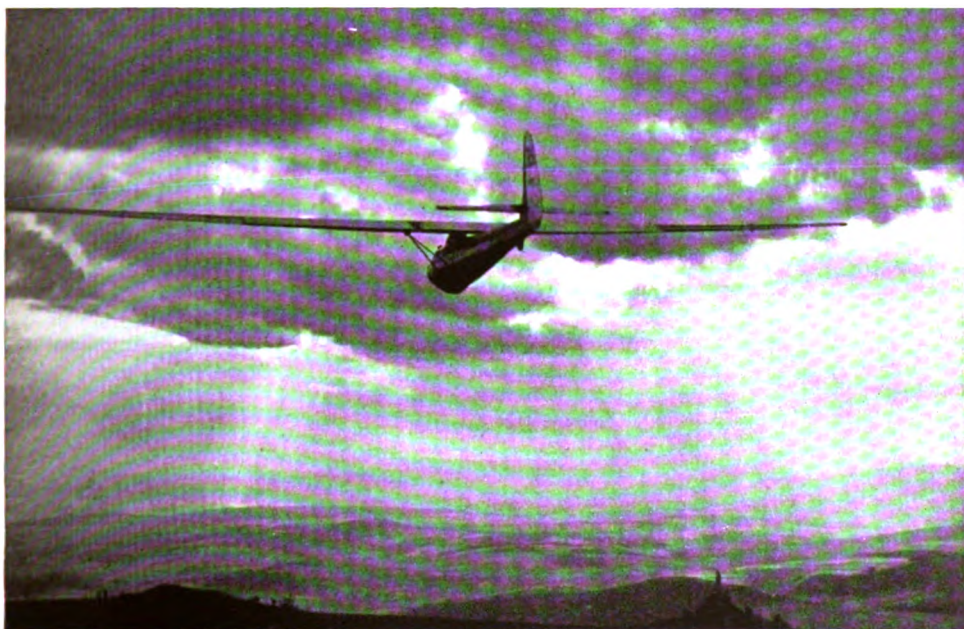
Already the inky mass was above the Wasserkuppe while the white clouds before it were torn to shreds in the driving wind. It was a magnificent spectacle. Sudden streams of lightning flared, flickered



AT THE WASSERKUPPE.

[Photo : Hermann Eckert.]

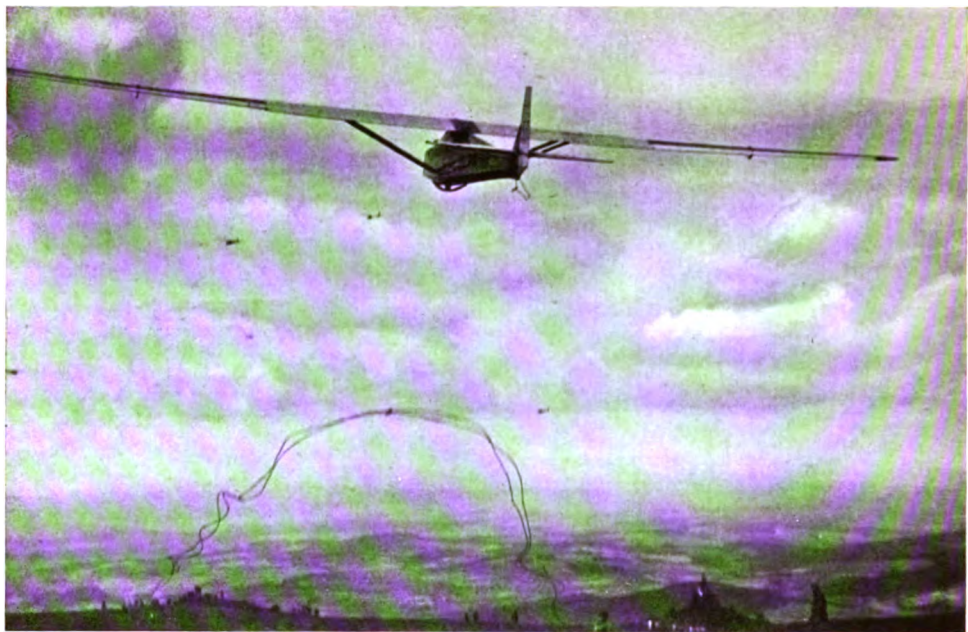
The great Fafnir starts on a long-distance soaring flight. Groenhoff is completely enclosed and carries elaborate meteorological instruments. This is the fastest of the high performance sail-planes, and in this Groenhoff made the world's record soaring flight of 265 kilometres into Czecho-Slovakia and won £300 worth of prizes at the Wasserkuppe Contests.



TOWARDS THE SUNSET.

[Photo : Hermann Eckert.]

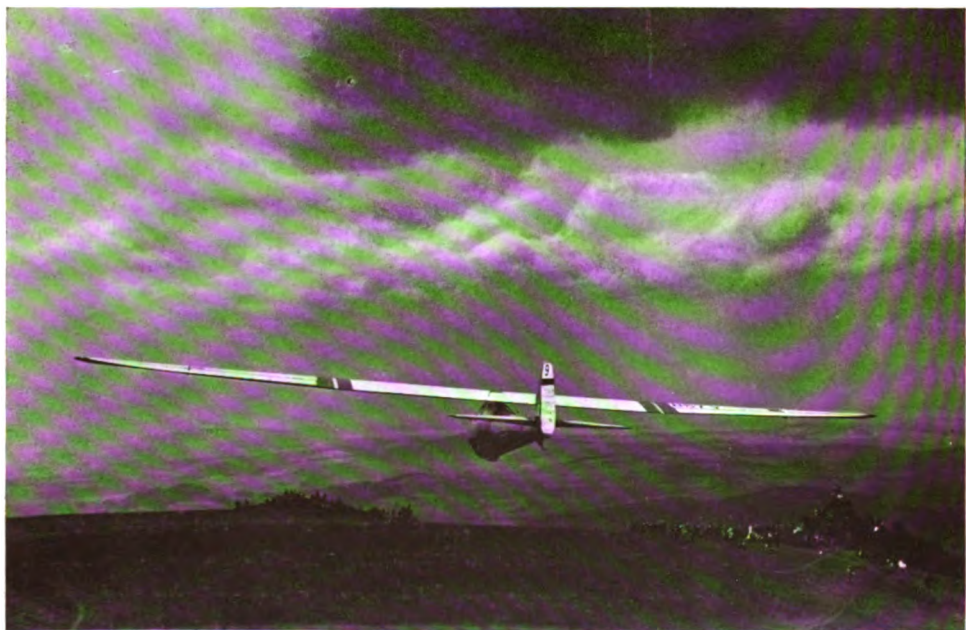
The start of an evening flight over the beautiful country of the Wasserkuppe. In the foreground, to the right, is the big eagle which has been erected as a memorial to the pioneers of soaring.



[Photo : Hermann Eckert.]

TO JOIN THE FLOCK.

The start of the first great thermal flight. Hemmer gets away to join the flock, and to try his skill in the warm rising currents. The elastic with which he has been launched can be seen falling in the foreground.



[Photo : Hermann Eckert.]

THE "MUSTERLE" TAKING FLIGHT.

Starting on a slope above the Hudson River, this sail-plane soared into the thermal currents that rise above all cities and so gained height to circle over the great roaring heart of New York City.

for an instant, and were gone. The darkness was torn again and again by the violet ribbons which seemed almost to crackle, so close were they above us.

A breath of wind passed over the plantations of young fir trees below. The shutters chattered on the huts. Beside me someone struggled with a match in a wayward gust.

On the short grass of the summit the crowd of sail-planes were now lined up like expectant seagulls. Their wings were spread in readiness. In their shining surfaces you could see reflected the changing terror of the sky. Their hour had come. They were come out to face the menace and the madness of the storm.

Yells of command rang out on the hillside and were snatched away by the gusts. All the teams were ready for the launching on the word. In a moment they would be away and that moment now became a matter of seconds. Who would go first into this devil's weather? A hand waved and, with a swirling rush, the first bird rose into the air.

They followed each other in breathless haste, as though fired from a gun. It was now or never. In six minutes twelve had taken wing. The thirteenth could not be launched in time and with a desperate haste it was rushed behind a hut for shelter from the gale. Hardly was it gone before the grass where it had stood was flattened by the first squall.

One machine had already dived into a cloud. It was greeted by a clap of thunder, so close that it shook the very ground on which we stood. It might have burst from the heart of the mountain. We swayed, dazed and deafened. Yet no one had eyes for anything but the pilots of the storm.

They swung, they circled, they jockeyed for position at the start of the race. They swam over each other like leaves in the wind, edging further and further away on the face of the storm and searching for those air-currents which were for them the very breath of life.

In almost less time than it takes to describe the group had dispersed North and South while some had already vanished into the clouds.

In a moment not one could be seen and the whole sky was a mass of swirling darkness. Then the downpour began, and the heavy rain cleared the ground of spectators as swiftly as the wind had borne away the fearless young sailors of the storm.

This is no fairy tale. It has just happened. These young modern German pilots set us a fine example. Their skill and daring have reaped already a rich harvest of knowledge. They are learning to master this new element just as our forefathers long, long ago, risked their lives to learn the mastery of the wind at sea.

F

LOOKING ROUND.

This was the twelfth Olympia of soaring. Visitors from all over the world were present though no nation except Germany actually entered for the contests.

It marked the close of a year of outstanding achievements, and all through the contests these events were constantly discussed.

Groenhoff, for instance, who is an instructor in the art at the Wasserkuppe, made this year the most astonishing thunder-storm flight right into Czechoslovakia. He was flying a very beautiful high performance sail-plane (the Fafnir) whose slightly curved wings sweep up and out and are more slender than those of any seagull I have ever seen. In the end the storm overtook him and he found himself in a terrific shower of hail. The stones could not reach his head for he was entirely enclosed, but his wings suffered. The hail fell on them with such violence as to riddle them through and through with holes. Some of his fabric when he landed was torn into shreds. The centre part of his wings were stronger.

They sloped down towards the body of the machine in which he was sitting. Here the hail pierced the upper layer, and gathering in the wings, began to melt and to flow down into his cockpit. After he had landed the water in his cockpit was ten centimetres in depth.

Earlier this year also, Hirth took his sail-plane, the Musterle, to America and starting from a slope 400 feet above the Hudson River he found some of the thermal currents which rise above all cities and on these he climbed and soared in silence high above the great, roaring heart of New York City.

What a year of achievements it has been! No wonder that we found ourselves on the Wasserkuppe in a centre of the greatest attraction.

It is quite a high mountain, only 104 feet lower than the highest in England—Scawfell. Yet they have made a road up it and even put hangars, huts, and a few wooden hotels near the top, all for the sake of soaring.

No wonder that on a Sunday afternoon Germany turned out to watch the contests in a crowd at least forty thousand strong until the slopes of the Wasserkuppe were black with people.

No wonder that everyone watched when the great three, Groenhoff, Hirth and Kronfield, were gathered together to test their skill.

In this year's contest there was a most striking increase in the number of junior entries. In fact they almost equalled the senior, which alone is enough to foreshadow the future of soaring. For no earlier contests have ever seen so many first-class cutters of the sky lined up for the start.

The contests lasted from the 22nd July to the 5th August, and, during that time anything which might happen would be officially observed.

From the first day they had been of the keenest. From dawn to dusk an eager crowd were gathered on the hill-top to launch their beautiful sail-plans, and to watch them soaring away into the distance.

New designs were not conspicuous this year. The Rhön Rossitten-Gesellschaft had grouped the entries into three main categories: school (or elementary), training (or intermediate) and advanced (or high performance).

With characteristic German thoroughness, this year has been devoted to the development of the intermediate class, with the result that the new intermediate machine (the Falke) has equalled the earlier performances of the most advanced type. Next year, the advanced class itself will be similarly improved, and the present advanced type will be supplanted by the "Super Falke."

This standardization into classes has emphasized the difference both in performance and in construction of the entries and it was undoubtedly the right policy to pursue. The "Professors" were by far the most beautiful vessels in the advanced class, and their exquisitely tapered wings, often transparent, were amazing achievements in construction.

In this year's contests, however, it was not the dramatic achievements of the masters in their beautiful craft that gave the most profound proof of progress, it was the extraordinary high standard among the beginners. They achieved right at the outset the performances of the leading pilots of only a few years ago.

It was only in 1922, after all, that the first soaring flight of an hour was achieved, and very few pilots could then enjoy the privilege of flights of endurance and of height. Nowadays these have become a matter of course. This is the true proof of improvement.

Gliding in fact has grown from an exciting, if rather childish pastime, to the really masterful art of soaring. Man has progressed in ten years from the coracle with sails to an efficient and most graceful cutter, and his voyages of discovery are now taking him far into the uncharted oceans of the sky.

The thermal flights of Hirth and of Groenhoff were the outstanding events in this year's Olympia. Groenhoff flew to the mountain of Taunus near Frankfort, while Hirth actually crossed the Rhine. These Westward flights were interesting both because of their length and also because they proved to be the beginning of an entirely new technique.

All long flights in previous years have been to the North and to the East. So, too, were the first thunderstorm flights in this year's competitions when Hirth and Groenhoff surf-rode that thunderstorm for 175 and 220 kilometres. This direction has always been chosen because the other slopes do not create so strong an up-current to help them at the start.

SUNSHINE.

The clear summer sky of Sunday, 2nd of August, 1931, was to unfold new secrets to man. There was a strong East wind, and not a cloud in sight. It was, apparently, a useless sky for soaring. Yet, early in the afternoon, there was an extraordinary sight to be seen. Away to the South were a flock of no less than twenty sail-planes, soaring like seagulls in a strong thermal up-current caused by the bright sunshine. Some were not merely circling and gaining slowly they were being carried up and up, until they became the merest specks, five or six thousand feet in the sky.

Groenhoff and Hirth took advantage of this height and both went off on a long-distance race, first to the East and then recrossing the Wasserkuppe, they gained fresh height under a cumulus which had begun to form meanwhile, and then turned away to the West.

Had we known it, we were watching the start of the first outstanding flights that men have ever made on the sunshine. For they used nothing but the heat of the sun and their own brains. Away they went out of sight. From cumulus to cumulus they swooped, each loss in height being regained in circling under these rising clouds. Away over the Vogelsberg range between the Rhon and the Taunus, often close together in the vast silences of the sky. It was like a dream.

The awakening came over the depression of Usingen near the Saalburg mountain where they were forced to separate. Try as he might Groenhoff could not regain his lost height and so ultimately landed 120 kilometres from the start. It was a disappointment, for this meant that he was not able to use the towering height of the Feldberg mountain and its up-current as a spring-board from which he could dive to Frankfort, the town where he was born.

Hirth, however, was more fortunate. He turned towards the valley of the Lahn River, still swooping from cloud to cloud till he passed over Ems and Oberlahnstein, where the Lahn joins the Rhine. He was to be the first man to cross the Rhine in a long-distance cross-country flight. Over it he soared as silently and swiftly as a bird, and turned above the Eifel range beyond, where, for the first time, the power of the sun failed him and he could not find warm up-currents on which to regain his height. So, for the first time since he had started, he was forced to fall back on the up-currents deflected by the slopes of the hills. Now even the hills and the wind failed him and he was forced to land in the valley of the Mosel near Cochem, 200 kilometres from his start on the Wasserkuppe.

When the pilot lands after a cross-country flight he usually telephones to the Wasserkuppe and a friend sets out to retrieve him by road. Often, in this way, during the contests we would see the

retriever starting off in a car with a trailer. By the time he arrives the sail-plane is probably dismantled and in a few minutes they are ready to begin the return journey.

So, late at night, you will hear the triumphant note of a tiny car towing an enormous trailer up the long slope for home. Looking out into the darkness you may see them passing. The gallant little car, the tired pilot, the driver happy to be back again, and the big bird folded on the trailer following its master with an amazing docility.

There is no doubt whatever that these two thermal or sunshine flights were the epics of this year's contests. To ride on a thunderstorm must be one of the most exciting sports that the wit of man has ever invented. But to float on the sunshine in the silence of the sky, with the far-off world spread out below, and nothing but the swish of the wings in your ears—that is thermal soaring, and it must be like a dream of loveliness.

Throughout the whole of this year's meeting, repeated attempts were made to win the Oechenberg Prize, which was offered for a return flight to the mountain of that name. The entrant had to soar to the mountain, return, and land within a given area on the Wasserkuppe. The most dogged perseverance was displayed by the pilots in their attempts to fulfil to the letter this exacting programme. It is true that Groenhoff and Hirth succeeded in getting there and returning. But they were never quite able on their return to reach the limits of their landing area on the Wasserkuppe.

The flight to the Oechsen Hill was not so difficult. Here the difficulty lay in the return on account of the deep, intervening valley, which had to be crossed against the wind, and therefore for a very long time in the down current.

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It is too easy to dismiss soaring as a "mere art," as something the usefulness of which is not immediately obvious. Our visit was crowned by the kindness of Professor Georgii and Herr Lippisch, who allowed us to see and touch their new and then secret tail-less aeroplane.

This is the first vindication of the utility of soaring for it is not too much to say that this wonderful machine is in a great part the outcome of lessons learnt in soaring flight.

So far, it had been shown only to a few initiates. It is the perfection by Lippisch of the tail-less idea, conceived by the Englishman, Major Dunne, and born by the genius of another Englishman, Captain G. T. R. Hill, under the name of Pterodactyl.

It is like a creature from another world. In shape it is triangular

like the corner cut off a postcard and in its flight its performance surprises even the most experienced.

The Research Institute of the Rhön Rossitten-Gesellschaft and the designer are to be congratulated on the extraordinary advance which they have made. This machine foreshadows the big commercial air liners of the future.

When in the future we look up from our windows over the crowded streets to see these great, bat-like, silver liners humming by, we may well go back in our minds to the silent soaring sail-planes and the slopes of the Wasserkuppe which contributed so much to their perfection.

FAREWELL.

We were sitting outside in the sunshine, now so much at home that we could hardly bear to drag ourselves away. What a glorious morning, and we must go.

Our taxi was ready, our bills were paid, and we knew that the train would not wait. Inside, in the dining-room the little yellow models of the beautiful sail-planes of 1931 were still hanging over the tables. Through the windows you could now see for miles over the mountains, dim in the summer haze.

Surely it could not be the same gloomy, storm-threatened, place full of rather fantastic fanatics that we found on our arrival? How much depends upon the point of view!

And of course we seemed to have met some of the most charming and interesting people only at the very last moment and there were still so many questions to be asked, and so much to be learnt. But we must go.

A few miles away I could see from the train the serene range of the Rhön, green and yellow in the noonday sun, and as I looked back I thought I saw a speck floating and hovering, and I knew that there was yet another pupil of this young art of soaring happy in the enjoyment of a pleasure, perfect because it is never completely satisfying.

TECHNICAL NOTES ON THE 1931 INTERNATIONAL COMPETITIONS AT THE WASSERKUPPE.

By S. SCOTT-HALL.

In 1930 the outstanding feature of the International Soaring Competitions at the Wasserkuppe was the long-distance flying in which use was made of line squalls and similar storms travelling cross country. This year was chiefly remarkable for the development of the technique of thermal flying.

The phenomenon of thermal currents ascending from the hot earth on a summer afternoon is well-known. They give rise to the disturbed air conditions so carefully avoided by test pilots, and their presence is indicated to those on the ground by cumulus clouds.

Very little is yet known of the growth, life and movements of thermal currents, but it may safely be said that from the soaring point of view they are far more difficult to detect than the up-currents due to line squalls, which by their violence alone inform the pilot of their presence, or those due to ground formations which can be anticipated from the contours of the land beneath. This difficulty of detection increases with height. For the "thermal" is drifted away from its source by the wind currents and in all probability is sooner or later broken up by secondary vortex action in the same manner as a smoke ring.

The influence of these currents is so mild as to be almost imperceptible to the human senses and the pilot has to fall back on special instruments.

Just as the ultimate success of power flying under all weather conditions depends on the perfection of instruments, so now it seems the success of soaring flight under all conditions depends on the same factor.

It was thus significant that the "Wien," the "Fafnir," and indeed nearly all the sailplanes which carried out successful thermal flights were equipped with a most elaborate set of instruments. The most important of these (next to the airspeed indicator) was undoubtedly the variometer showing rate of ascent or descent. There are several German types of this instrument with a considerable degree of sensitivity, one of which is developed by the famous firm of Askania. It was given as his opinion by a well-known German soaring pilot that no really successful thermal work could be carried out without a variometer.

Bank indicators and longitudinal bubbles were fitted to several aircraft in addition to the more common compasses thus making every provision in these aircraft for blind flying in clouds.

The "Fafnir" provided an example of such complete equipment and in order to accommodate all the instruments in the narrow space provided the vertical scale type has been adopted throughout. The "Fafnir" also carried an external recorder for the measurement of humidity; this no doubt was in connection with the research work which is a big feature of the programme of the Rhön Rossitten-Gesellschaft. The aircraft was first flown in 1930 but proved very disappointing. Very high hopes had been entertained of its performance, but when the machine had been completed it was found to be much heavier than estimated, and there was a lack of lateral control to such an extent that the aircraft was unsafe in rough weather. This was all the more surprising since the pilot was totally enclosed in the body, and the lines were exceptionally clean. However, it was found that a curved fairing between the body and wings was the cause of the trouble. A sharp-angled junction was substituted, and the control was then found perfectly satisfactory. Groenhoff carried out some very fine flights this year with the "Fafnir" and the original hopes of its designer, Herr Lippisch, have been realized.

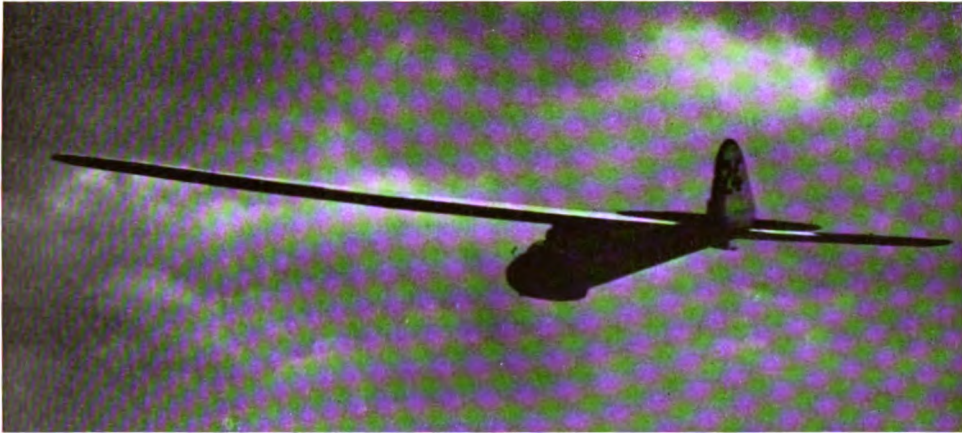
In dealing with equipment it is interesting to note that a large number of aircraft now carry parachutes. It was understood that a suitable back type could be purchased for 800 marks (£40) weighing about 8 kilograms ($17\frac{1}{2}$ lb.).

In 1930 the only aircraft the author remembers having seen which was equipped with a parachute was Kronfeld's "Wien" and it is significant that the sacrifice in weight is now considered worth while by so many.

The difficulty of getting clear from these very small cockpits especially in the case of structural failure of a wing or tail unit would be extremely great, and render their successful use questionable. Whether any escapes have been made in Germany is not known to the writer but a case in the United States has been heard of.

Turning to the design features of the various competing aircraft it must be admitted that in general aerodynamic characteristics there is little change from the aircraft of 1930. These were very well streamlined and had good soaring qualities. They would be very hard to improve. Aspect ratios are as high as ever and span loadings correspondingly low. The impression this year is that the tendency now is to produce a cheaper, less highly finished, machine in which only the essential high performance characteristics are retained.

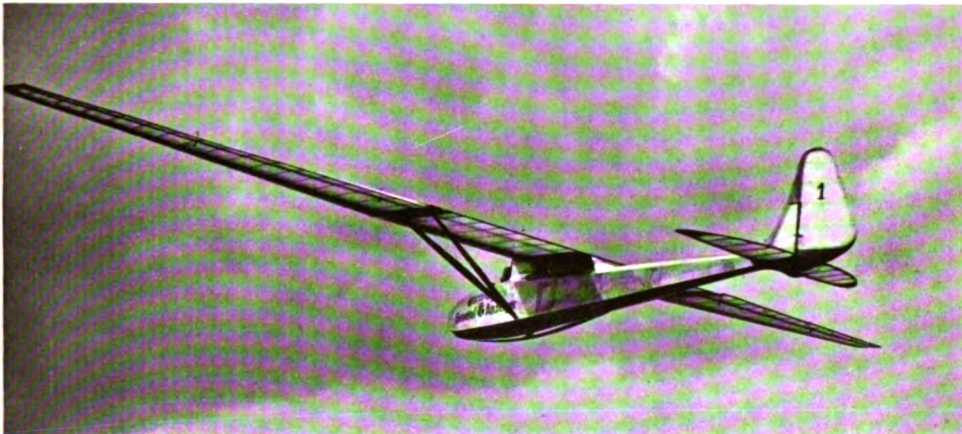
An example of this is the "Kassel" 25, a very practical looking machine from the point of view of simplicity of construction but lack-



TO SURF-RIDE THE STORM.

[Photo : Hermann Eckert.]

Bachem gets off at the right moment to ride on the face of a thunderstorm. Twelve sail-planes were launched on to the waves of the air in six minutes on this occasion.



SENIOR DURATION FLIGHT—WINNER, 1931.

[Photo : Hermann Eckert.]

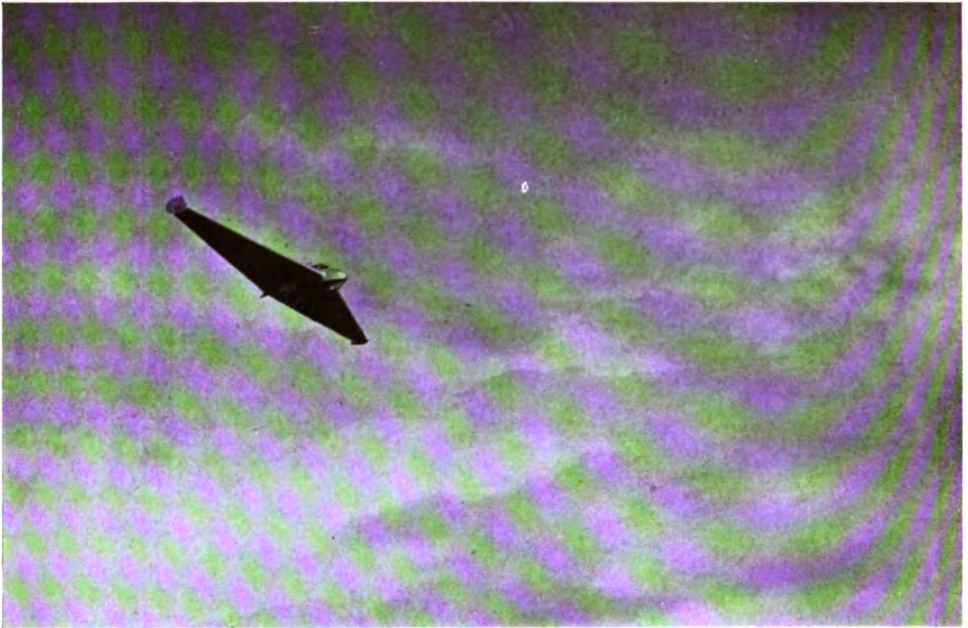
The start of a soaring flight of nine hours. The Wurzt-Burger Generalanzeiger takes flight on transparent wings like a motionless dragon-fly.



GERMANY BEGINS TO GATHER.

[Photo : Hermann Eckert.]

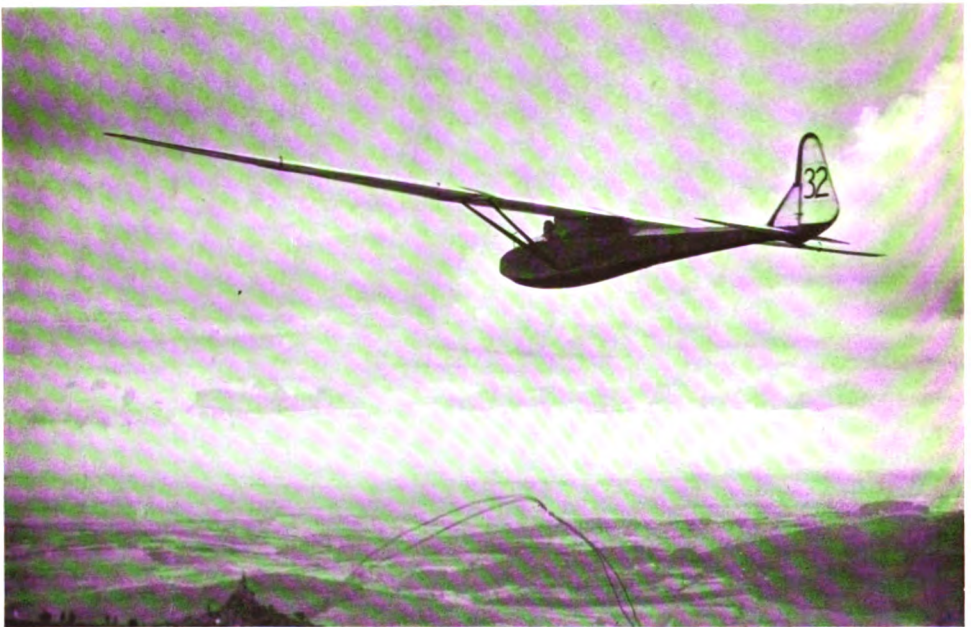
Some of the crowd of over 40,000 who climbed into the mountains to watch the Contests.



[Photo : Hermann Eckert.]

AT THE WASSERKUPPE : THE FUTURE.

The new tail-less wonder, Herr Lippisch's "Kohl" aeroplane which flew on the Wasserkuppe at the end of the meeting, and illustrates a fundamental and inevitable development in aircraft construction.



[Photo : Hermann Eckert.]

BERNARD FLINCH, IN THE FRANKOFURTIA, SETS SAIL TO THE WEST.

The sky and sunshine promise thermal currents, and this picture conveys admirably the stability of this type, which soars "as if on rails."

ing something of the beauty of line of its forerunner, the "Professor" and certainly not in the same street as the "Wien" or the "Fafnir." It is, however, a very popular aircraft and is very cheap, costing only £75. Five of the type were competing in this year's competitions. The span is 59 feet and Aspect Ratio 21.1 so that the span loading criterion and efficiency from this point of view should be very good. The detail design strikes one as a trifle crude. On one entered by the Kassel works themselves it was noticed, for instance, that the fairings to the wing struts were cut off square at the ends and left open without any attempt to finish them off in conformity with accepted ideas on aerodynamic resistance.

The vogue of auto-towing is spreading to Germany in spite of their original dislike for this form of launching. Several sail-planes had additional strengthening for towing in the shape of cables from the nose to the wing fittings for the struts. Very many were fitted with the special release hook necessary and one machine, the "Datschi" was fitted with a controllable hook half-way down the body for auto-releasing.

From conversations with an American pilot it was learned that several fatalities had occurred in the States through towing primary instructional gliders which, besides being unsuitable aerodynamically, had not been strengthened structurally for the work. These rather naturally gave a decided set-back to the movement, and showed the necessity of keeping development work of this kind in qualified hands.

Towing has brought in wheels and wheel brakes for sail-planes in England and America. The wheels used are generally of very small low-pressure type, and the axle is mounted straight on to the fuselage, without any undercarriage.

The "Stanavo" was, however, the only machine in the competitions equipped with a wheel landing gear. It was fitted with a single Good-year wheel sunk into the body near the rear of the skid so that the tread of the tyre projected an inch or so beneath the skid surface. The wheel was fitted with a brake controlled from the pilot's cockpit. The wheel is claimed to make the aircraft much easier to "flat-turn" on the ground when moving at low speed, as in the case when avoiding an obstacle at the last moment of landing, and obviously makes ground handling much easier. The brake is almost a necessity—not a luxury. When applied the wheel is locked, and the machine slides on skid and wheel, but the landing "run" of this combination is, it is said, no less than with the plain skid.

Of individual aircraft in these competitions there is not very much to say. The "Wien," which has achieved such outstanding fame in the hands of Kronfeld is practically unaltered except for the addition of a small fairing above the pilot's head, and the release apparatus for towing. The alterations to the "Fafnir" have already been described.

A newcomer attracting immediate attention was Hirth's "Musterle."

The cantilever wing is of Gottingen 536 section—which is so popular for this type—modified slightly towards one of the classical Joukowski aerofoils. A streamlined hood completely enclosing the pilot was being tried when the aircraft was inspected. It has an interesting feature in that the whole cockpit opening can be covered over with a wooden panel and locked. This must be very useful when the machine has to be left at the mercy of prying visitors to soaring meetings, as the only mischief left for them to do is to blow into the airspeed indicator. The "Musterle" has a very complete set of instruments.

The large Dresden D.B. 9 was competing this year. It was flight-tested for the first time during last year's competitions. It is a two-seater designed for alighting on the water as well as on land. Its chief technical interest lies in the airbrakes with which it is fitted. These consist of small flaps in the upper surface of the leading portion of the wing mid-way between the centre section and the tips. When the brake lever is applied in the cockpit these flaps hinge forward destroying the circulation at their points of attachment. The aerodynamic effect of this is to divide the single wing into three wings with corresponding increase of induced drag.

A curious freak was the "Stadt Magdeburg." This tail-less glider had as complicated a wing as it would be possible to devise—according to its designer, the result of wind tunnel tests. It would be very difficult to describe without the aid of photographs, and it seems unnecessary as the machine was not outstanding as regards performance. The fundamental idea of the wing design appeared to be pronounced decreased incidence at the tips, giving presumably good lateral stability. The elevator control looked very inadequate, but this is usually the case on tail-less aircraft, and is always a false impression.

The most interesting aircraft at the Wasserkuppe was, however, not a sail-plane at all. The "Kohl" is a tail-less aeroplane designed by Herr Lippisch, and a natural development of his earlier tail-less aircraft the "Storch." Now that the machine has been demonstrated publicly at Tempelhof, and photographs have appeared in the public press the previous ban of secrecy is presumably removed.

The "Kohl" is a remarkably clean straightforward design. It has a three-seater body with air-cooled engine mounted at the rear. The wing is triangular in plan, the trailing edge being nearly straight, and the leading edges having pronounced sweep-back. Large ailerons are fitted, and the inner portions of the trailing edge are occupied by elevator flaps. The twin rudders are mounted one at each end of the wing. The wheel base is triangular, the front single wheel being steerable for manœuvring on the ground. Groenhoff put it through its paces one evening, and demonstrated its remarkable manœuvrability in the air.

One gathers that the military authorities of both Germany and Russia are devoting much attention to the tail-less type.

Considerable time was spent at the Wasserkuppe discussing spinning. The conclusion was reached that the term is used very much more loosely on the Continent than it is in this country, and may indicate anything from a steep spiral dive at less than stalling incidence to a true flat spin.

The question arises somewhat forcibly in relation to soaring flight. Many descriptions have been published now of motorless aircraft spinning, and undoubtedly some of these which occurred during cloud flying were true spins in the sense that the machines had been stalled.

But there are others which seem with equal certainty not to be spins at all. Sail-planes, by reason of their extremely light wing loading, are very much more influenced in flight by the local movements of the air than a power machine. Their controls, too, are very much less effective. It seems likely, therefore, that a sail-plane might enter a stream of air moving downwards on a spiral path, and though the machine had flying speed, it would follow the same evolutions as a cork in a whirlpool. A pilot had this experience on one occasion when soaring over a disturbed region, and from the fact that the ailerons had their normal control, the airspeed was 10 m.p.h., above stalling throughout the whole motion, and recovery was effected with the stick back, it is evident that the involuntary manœuvre was not a spin.

A similar episode to this was witnessed from the ground at this year's competitions when an aircraft crashed in a steep spiral from a low altitude. There was nothing in the attitude of the aircraft prior to this to suggest stalling, nor was the pilot attempting to land, yet the accident was loosely described as a spin.

Considerable use is being made of sail-planes for research purposes. The Deutsche Versuchsanstalt für Luftfahrt in Berlin collaborate with the R.R.G. in this work. Accelerometers have, for instance, been fitted to several machines, and measurements made of "bumps" over prolonged periods.

The enthusiasm at the 1931 competitions was just as high as ever, especially amongst the "Novices," whose performances were exceptionally good.

Perhaps one of the most stirring events of the whole meeting was the prize-giving on the last night. This was held in the open air by the light of torches. The German Minister of Transport was present and the prizes were given away by Herr Ursinus and Professor Georgii.

The fervour with which "Deutschland über Alles" went up at the conclusion, and the enthusiastic faces of these hundreds of young students, could leave no doubt in the mind of the onlooker that Germany's future in the air is assured for all time.

MEDICAL RESEARCH WORK IN THE ROYAL AIR FORCE

A FURTHER APPRECIATION OF THE WORK OF THE LATE GROUP-CAPTAIN
MARTIN FLACK, C.B.E., M.B., B.CH., R.A.F.M.S.

(Continued from page 602, Vol. II No. 4.)

Group-Captain Martin Flack was born in the village of Borden, Kent, in 1882 and educated at Maidstone Grammar School and later at Yarmouth Grammar School, whence he won an open scholarship to the University of Oxford. He began at Keble College and later transferred to University College where he remained for the rest of his university career, studying under Professors Arthur Thomson and Gotch and Dr. Haldane, and graduating in 1908 as M.B., B.Ch.

His interests were chiefly in the direction of physiology—the science which deals with the mode of action of the various organs of the body—and whilst at the London Hospital he was associated with Dr. (now Sir) Leonard Hill as a demonstrator in physiology. It was here that he laid the foundations of that practical knowledge of physiology that was to make him of such value to the Royal Air Force in later years in tackling the medical problems of flying. He gained the Radcliffe Travelling Fellowship which enabled him to study in Liege, Heidelberg and Berne, and to improve his knowledge of French and German to the point where he could discuss in those languages abstruse problems of medical science with great fluency, a fact of enormous importance when he was called upon to act as British Delegate to numerous international conferences both at home and abroad, where his knowledge of his subject, and fluency in expressing that knowledge, rapidly gained for him a world-wide reputation.

On his return he followed Sir Leonard Hill to the Department of Applied Physiology of the Medical Research Council and was lent from there to the Army, where, in conjunction with Dr. Mervyn Gordon, he investigated and was largely instrumental in suppressing the epidemics of cerebro-spinal fever that were at that time producing heavy casualties among young recruits.

About the time when this work came to an end, he was recommended by Sir Walter Fletcher of the Medical Research Council to be lent to the Services Medical Advisory Board for the purpose of investigating the special problems of physiological medicine in relation to flying that were causing them much anxiety.

He was gazetted to an honorary commission in the Royal Army Medical Corps, and at once set about the task that was to occupy him until his death fifteen years later. He passed through the various stages of promotion and was eventually gazetted to a permanent commission in the newly-formed Royal Air Force Medical Service, appointed to be Director of Medical Research, and in 1923 promoted to Group-Captain.

He had the three qualities most necessary for a man in his position, viz., a wide knowledge of physiology, especially in those of its aspects that are most concerned in the problems of flying; experience as an investigator and, what is far more important, aptitude for research; and sympathy with the ideals and understanding of the objects, methods and difficulties of the flying services.

The flying man of to-day has much to be grateful for in the work of Martin Flack, whether that work was individual or done in concert with his colleagues. The principles on which the assessment of physical fitness for flying is based in this country at the present time rest on Flack's tests, and there is a growing tendency among other countries to follow suit. He was essentially a practical man, and his tests, though simple and easy of application, with a small amount of apparatus, yield all the information now deemed necessary in addition to the ordinary medical examination as carried out for insurance and other purposes. After prolonged trials and consideration of resulting data, he gradually decided more and more against the more purely academic tests of fitness for flying that were much favoured in other countries, and concentrated on accurate evaluation of the results of such simple practical tests as balancing on one leg, blowing against a column of mercury, raising the body five times in fifteen seconds to the height of a chair-seat, etc., and it is believed that the result has amply justified this policy.

Flack's work is largely responsible for the fact that the modern high-altitude pilot can carry out his duties in relative comfort by virtue of the development of oxygen supply, and can feel as confident of his safety while doing so, as at cruising heights. It is not generally known that the present advanced state of this development is almost entirely due to Flack's insistence on the importance of this aid to high flying. The problems of maintaining bodily heat in the air, especially at great heights, was another object of his investigations, and was eventually solved with his assistance by the provision of electrically heated clothing. The same principle was later extended to the warming of the glasses of flying goggles in order to prevent their "misting" through the condensation on them of water evaporated from the skin.

Other important investigations were carried out by Flack in connection

with the testing of pilots in a chamber under reduced temperature and pressure, the medical problems of chemical warfare, comfort in flying, prevention of head injuries, in the event of a crash, by padding the edges of the cockpit with sponge-rubber, deafness resulting from mechanical noise in flying, ventilation of enclosed aircraft, arrangement of dashboards for greater ease in reading instruments, and a host of other activities, major and minor.

Group-Captain Flack represented the Director of Medical Services, Royal Air Force, on many committees, service, inter-service, national and international, and was gifted with an easy manner that made him a popular figure wherever he went. He was a good mixer, and a great-hearted fighter, and though no man is indispensable it will be very hard to make up for his loss.

MAJOR EDWARD "MICKY" MANNOCK, V.C., D.S.O., M.C.

BY CAPT. J. MORRIS, B.A., A.F.R.Ae.S.

EDWARD MANNOCK was born on May 21st, 1888. On the outbreak of war he was engaged as a Post Office engineer in Turkey, and when in November, 1914, Great Britain and France declared war on the Ottoman Empire, Mannock was put in a prison camp. In April, 1915, he was repatriated to England as an exchanged prisoner of war owing to his defective eyesight.

On April 1st, 1916, he was commissioned in the Royal Engineers after service in France in the ranks of the R.A.M.C. In the following August he became attached to the Royal Flying Corps and was posted to No. 1 School of Aeronautics, Reading. A month later he began a course at the Central Flying School, Upavon, and on November 28th, 1916, he was granted the Royal Aero Club Certificate No. 3895. In the following week he was posted to No. 19 Reserve Squadron at Hounslow, and on February 1st, 1917, he was appointed a Flying Officer. After a course at the School of Aerial Gunnery, Hythe, and some higher instruction in No. 10 Reserve Squadron at Joyce Green, he proceeded to France on April 6th, 1917, to join No. 40 Squadron at Treizennes. Mannock was thus nearly twenty-nine years of age when he entered upon his flying career proper. On May 7th he achieved his first success when he shot down an enemy observation balloon in flames. It is a coincidence that Mannock's light should begin to shine immediately that of the renowned Capt. Ball went out, for it was on May 7th, 1917, that Ball failed to return from his last offensive patrol.

Albert Ball was still a minor when he was killed—he was born on August 21st, 1896—but in aerial fighting he was the leading veteran. His prowess and gallantry had earned for him the D.S.O. with two bars, and the M.C., to which the V.C. was added posthumously.

Ball nearly always flew alone. Mannock generally flew in formation.

Ball set the Royal Flying Corps a high standard of courage and determination; Boelcke set the German Flying Corps a high standard of leadership; Mannock was the embodiment of a Ball and a Boelcke. Mannock was 5 ft. 11 ins. tall, and rather lean. He had dark brown hair and a weather-beaten face. He was believed to have had wonderful eyesight, but in fact his left eye was so defective that his captors in Turkey released him as unfit for military service. He was of jovial disposition, highly strung, and somewhat impetuous. When inactive he was inclined to be depressed, but in the air he was brilliant.

Up to the Summer of 1915 air combats were the exception rather than the rule; the armament employed was crude, and no satisfactory air fighting tactics had been evolved. There was even no definitely accepted ideas as to what type of machine would prove the best fighter, single-seater, two-seater, tractor or pusher.

An anonymous paper prepared about the end of 1914 stated that "the present armament of single-seater aeroplanes, viz., carbines in fixed rests, or Webley Scott pistols, is not very effective. To aim a single bullet by aiming the aeroplane is a difficult operation, and to handle a machine with one hand whilst aiming a pistol with the other is also not conducive to good marksmanship." The writer put forward two suggestions. The first advocated the use of blunderbusses designed to fire the heaviest possible charge of grape and chain shot, the recoil to be taken by buffers of not prohibitive weight. "The gun might be mounted on the aeroplane to fire either upwards and backwards or downwards and forwards, straight downwards, or downwards and backwards. It would be dangerous to fire upwards and forwards, as a successful shot would probably bring the enemy down on one's own machine."

The second suggestion was for a bomb or grapnel (or both combined) to be trailed from the aeroplane on a wire about 100 feet long, with "an ignition arrangement so devised as either to explode the bomb when the hooks catch on anything, or to explode it at any moment the pilot wishes. With such a device it is possible for a pilot of a fast machine to hook the grapnel on the trailing edge up to the rear spar, explode the bomb, and thus at least break up the rear spar."

Another contemporary paper on the subject of attack of hostile aeroplanes explicitly stated that "the question of fixed armament, so that the enemy is aimed at by not moving the weapon, but by piloting the machine so that the sights come on, is not considered."

In a memorandum on "Fighting Hostile Aeroplanes in the Air," issued apparently in the early part of 1915, the following passage occurs: "Although it is conceivable that charging may be resorted to under certain conditions, such a procedure can only result in equal losses on both sides."

The general utility machine with which squadrons of the Royal Flying Corps were for the most part equipped during 1915 was the B.E.2c with the 90 h.p. R.A.F. engine, a two-seater tractor, with the observer in front—a most unsuitable machine for fighting. At first a machine-gun was mounted at the back of the observer's seat so that the observer could only fire backwards towards the tail of the machine and over the pilot's head. Thus it was only possible to fire at the enemy when flying away from him. In order to fire forwards in a



MAJOR EDWARD "MICKY" MANNOCK, V.C., D.S.O., M.C.

tractor the gun had to be set at an angle so as to just miss the propeller. This necessitated a sort of sideways attack, involving a variety of complications in sighting owing to the gun firing at an angle to the line of flight. Some of the more scientifically-minded pilots worked out the appropriate deflections and set their sights accordingly. The most successful was Capt. Lanoe Hawker, R.E., who, when in No. 6 Squadron, mounted a machine-gun on a Bristol Scout and thereby gained the first V.C. for success in air fighting.

Then the Germans sprang one of the great surprises of the air war. They introduced the Fokker single-seater tractor monoplane provided with a machine-gun fixed to fire through the propeller and operated by a device synchronized with the engine, and further a definite tactical scheme was evolved for its use. This was based on the ability of the Fokker to dive steeply. The Fokker pilot would cruise at great heights over the German lines to keep a look-out for artillery and reconnaissance machines. He would swoop to the attack from behind, diving when possible out of the sun, so that the intended victim might be taken completely by surprise. As the Fokker pilot dived past he would fire one long burst at his victim and then continue until well out of range. If the victim was not shot down, and carried on with his work, the German pilot would climb and get into position for repeating his swift diving attack. Further, the Fokker's great climbing power enabled it to rise rapidly from the ground to intercept the slower reconnaissance machines. Soon, too, Fokker pilots, inspired by Immelman, learnt how to avoid a long climb after a diving attack. Immelman invented the famous turn whereby a machine zooms up, turns sideways over the vertical, and comes out facing in the opposite direction. By this manoeuvre the Fokker pilot was enabled rapidly to repeat his attack without the necessity of a cumbersome climb.

The Fokker monoplane, with the 100 h.p. Oberursel rotary engine, had a speed of 84 miles per hour, and could climb 6,000 feet in just over eleven minutes. The B.E.2c, with the 90 h.p. R.A.F. engine, had a speed of 72 miles per hour, and took twenty minutes to climb 6,500 feet.

For a time the Fokker, with its firing gear, put the Germans in a predominant position in regard to air-fighting. This was during the winter of 1915—1916. Meanwhile, however, British fighting machines were being designed, and when, in the spring of 1916 they made their appearance, the Fokker era began to wane.

The British machines which vanquished the Fokker were mainly pushers, which were designed before the problem of firing a machine-gun through the propeller of a tractor had been solved. They were chiefly the Vickers and F.E.2b two-seater pusher fighters, and

particularly the D.H.2 single-seater pusher fighter. By July, 1916, when the Battle of the Somme opened, the Fokker menace had completely disappeared. Moreover, at the beginning of the battle, the Royal Flying Corps launched an air offensive in which fighting and bombing machines working in formation flew well into German territory, seeking out and attacking enemy aircraft even over their own aerodromes. This policy, combined with the fact that the Germans were caught at a disadvantage—they were still preoccupied with Verdun—enabled the Royal Flying Corps to achieve the greatest ascendancy over the German air service which they ever enjoyed.

But towards the end of the battle the Germans made energetic efforts to retrieve their position. Reinforcements were hurriedly rushed up from Verdun and elsewhere. Most important of all, they followed the British lead by forming special single-seater fighter flights (*Jagdstaffeln*) whose sole duty was fighting. The most renowned of these was No. 2, whose pilots had been specially selected by Capt. Oswald Boelcke, who was then Germany's most distinguished fighting pilot.

Under the influence of Boelcke's *Staffel*, equipped with the Halberstadt Scout armed with two fixed guns firing through the propeller, the morale of the German air service began to creep up again. Thoroughly reorganized and greatly reinforced, the German air service in the spring of 1917, sprang the second and last big surprise on the Royal Flying Corps. Not only were their new fighting machines, notably the Halberstadt and Albatros Scouts of superior performance, but they tentatively formed the first "Circus" under von Richthofen, Boelcke's most brilliant protégé. The first official "Circus," however, was not formed until the following July. Designated No. 1 *Jagdschwader*, it consisted of Nos. 4, 6, 10 and 11 *Jagdstaffeln*, the whole under the command of von Richthofen.

These "Circuses" consisted of groups of four fighter flights, in all some forty-eight machines, manned by picked pilots, and led in the air by the O.C. "Circus" himself. They were moved from time to time to parts of the line where the German air service needed help and reinforcement. .

When, however, the new British models began to arrive, notably the S.E.5 single-seater fighter, the two-seater Bristol Fighter, and the D.H.4 two-seater fighter-bomber, the situation was once again restored in favour of the Royal Flying Corps.

The effect of the German superiority at Arras compelled the pilots of the Royal Flying Corps to improve and tighten up their formation flying, to increase the size of their formations, and to improve their shooting. During 1916 formation flying was not clearly defined, and was based predominantly on pairs of machines acting in concert and

mutually supporting one another. In 1917 the triangular, or wedge formation of the British Archers at Hastings was found to be the most satisfactory, and the basic unit henceforth was three machines, with the leader as the spear head. The lesson of Hastings, however, had to be learned afresh, and any and every stratagem on the part of the enemy to cause formations to break up so that their members could be dealt with piecemeal had to be rigorously frustrated.

It was a very critical period, therefore, in the history of the Royal Air Force when Mannock made his appearance on the Western Front. Hawker had been killed in November, 1916, after an epic duel with von Richthofen, who after Boelcke's death as the result of a collision in October, 1916, rapidly rose to become Germany's leading air fighter, and the Royal Flying Corp's most respected foe. Ball was killed in May, 1917, while Bishop and McCudden had not as yet attracted any particular attention.

On June 7th, 1917, Mannock rendered his first combat report after shooting down an enemy aeroplane, a single seater :—

" When escorting machines N. of Lille one H.A. attempted to dive on one of the leading F.E's., but turned before diving. Nieuport engaged H.A. at very close quarters and fired approximately 30 rounds into the pilot's position and engine of H.A.

" H.A. turned upside-down, nose-dived and spun, obviously out of control.

" Nieuport endeavoured to watch H.A. crash, but was unable to do so."

The crash, however, was witnessed by two other pilots of the formation.

On July 19th, 1917, Mannock was awarded the Military Cross, and three days later was appointed Flight Commander, with the temporary rank of Captain.

Between June 7th, 1917, and the end of the year Mannock submitted twenty combat reports, and in six cases only did he claim to have definitely crashed an enemy machine. In all these combats he fought in the Nieuport Scout. This was a single-seater tractor biplane, with the 110 h.p. Le Rhone rotary engine, which had been produced in the early part of 1916 by the French. In this machine the head of the pilot was under the top plane, but by standing up he could see over it, so that there was only a very restricted blind area above and in front. The view behind, except under the tail, was unobstructed. The view over the side was also good, as the lower planes were very narrow, so that the slightest kick of the rudder would swing them out of the way, and thus afford a clear view below. The difficulty of firing forwards was got over by mounting the machine-gun on the top plane so that its line of fire cleared the revolving propeller.

When in that position the trigger was pulled by a Bowden cable running down the control lever. The gun could also be pulled down so as to fire upwards at a steep angle, which was the favourite method of attack by Capt. Ball, who achieved the bulk of his victories with the Nieuport Scout. By skilful manoeuvre Ball would "zoom" up immediately beneath his intended victim, and then by a slight oscillation of the control lever he would cause his gun to rake his target fore and aft. Ball's security lay in the fact that he fought at such close range that other hostile machines present were precluded from firing on his Nieuport for fear of hitting one another.

Towards the end of 1917 No. 40 Squadron had been re-equipped with the S.E.5a. Designed by the Royal Aircraft Factory, the S.E.5a was a single-seater tractor biplane, with the 200 h.p. Hispano-Suiza engine. It was armed with a fixed Vickers gun firing through the propeller by means of a Constantinesco firing gear, and also with a Lewis gun firing over the top plane, as in the Nieuport. The S.E.5a was a refinement of the S.E.5, with the 150 h.p. Hispano-Suiza engine. The speed of the S.E.5a near the ground was 125 miles per hour, or 15 miles per hour faster than the Nieuport. The respective rates of climb were about the same up to 10,000 feet, which they reached in ten minutes, but above that height the S.E.5a was superior in climb. The speed of the S.E.5a was 121 miles per hour at 15,000 feet, to which height it could climb in nineteen minutes, whilst its ceiling was 23,000 feet. The Nieuport was just stable with the rudder fixed; the S.E.5a was completely stable in similar circumstances, and in addition had a movable tail plane which allowed it to be trimmed throughout a range of speeds.

The first combat report rendered by Mannock after he had started to fly the S.E.5a is dated January 1st, 1918, when he shot down an enemy machine to crash in our lines. The following day he was posted home.

At this period the most famous British fighting pilot was Capt. J. T. B. McCudden, who was then a Flight Commander in No. 56 Squadron, to whose long list of victories he had made a considerable contribution.

In March, 1918, McCudden left No. 56 Squadron for a period of service at home. He was killed as the result of an accident on July 9th, 1918, when he was flying to take command of No. 60 Squadron. He was then twenty-three years old. Between September, 1916, and March, 1918, he had definitely destroyed forty-two enemy aeroplanes, of which nineteen fell in our lines. He was awarded the V.C. in March, 1918. In a pamphlet entitled "Fighting the S.E.," which he wrote in January, 1918, he said, "I consider it a patrol leader's work to pay more attention to the main points affecting the fight, than to do all the fighting himself."

"As a patrol leader," says his V.C. *Gazette* notice, "he has at all times shown the utmost gallantry and skill, not only in the manner in which he has attacked and destroyed the enemy, but in the way he has, during several aerial fights, protected the newer members of his flight, thus keeping down their casualties to a minimum."

In his book, *Five Years in the Royal Flying Corps*, McCudden, referring to the early part of 1917, when he did a period of duty as a Wing Fighting Instructor in England, says, anent Joyce Green, where No. 10 Reserve Squadron was stationed, and where he had his headquarters, "The pupils here during the period of which I write were very good. One I particularly remember, named Mannock."

If McCudden could have chosen his successor, he would most probably have selected Mannock. Mannock and McCudden had much in common. Both were imbued with the spirit, determination and nerve of a Ball, and both had the patience of a Job, and the cunning of a Cagliostro. They would stalk enemy machines for an hour or more, and then let them go if they could not get into a favourable position for attack. "Enemy Scouts," wrote McCudden, "are not often seen above 15,000 feet during the winter months, the reason being, I suggest, that the Albatros Scout, which constitutes the bulk of enemy scouts, is a very cold machine in comparison with the S.E.5, so that enemy pilots do not go up high during the cold weather, unless for some good reason; therefore, I usually take my patrol over the lines at anything over 14,000 feet. Nine times out of ten I am above enemy scouts during the whole of my patrol."

"... I find that as soon as we attack scouts, one of them, more likely than not their leader, flies off out of the fight and climbs his utmost until he is above the top S.E., and then he comes back, and it is just the thought that there is a Hun above you that divides your attention and nullifies your advantage in height; so as soon as I see the one Hun going off I climb as well, and this usually frustrates his intentions."

"... When attacking a two-seater, it should be a pilot's main object after surprise to get to close range (100 yards) without letting E.A. gunners shoot at you."

"... One should be very alert when firing at an E.A. at close range, so that when E.A. falls to pieces, as they often do after being fired at a lot, that one does not fly through the wreckage. I narrowly missed flying through a pair of E.A.'s wing's recently."

After some three months' service at home Capt. Mannock returned to France as a Flight Commander with No. 74 Squadron. This Squadron was formed at Northolt on July 1st, 1917, and proceeded overseas on March 30th, 1918, equipped with the S.E.5a. Whilst leading his flight on May 12th, Mannock encountered a formation of

eight enemy scouts. He attacked the rear machine at right angles at close range. "E.A. side-slipped under me and collided with another Albatros, which was banking below. Both fell to pieces." While the remainder of the patrol were fighting the other enemy machines, of which three were crashed, Mannock engaged a "Pfalz from behind, and fired almost a drum from Lewis and same number from Vickers. Machine went down vertically," reported Capt. Mannock, "and I was able to observe it dive into the ground."

Early on May 21st, Mannock destroyed an enemy two-seater, and in the evening his patrol fell in with six Pfalz Scouts, of which five were destroyed, three by Mannock.

On June 19th Mannock proceeded on leave. From April 12th to June 17th, 1918, Mannock destroyed twenty-two enemy aeroplanes, whilst serving with No. 74 Squadron. During his service with this squadron Mannock added to his M.C. and bar, the D.S.O. with two bars. On his return to France at the beginning of July he assumed command of No. 85 Squadron (S.E.5a), to which he had been appointed on June 21st. No. 85 Squadron had arrived in the field on May 22nd, 1918, with Major W. A. Bishop, V.C., D.S.O., M.C., in command.

McCudden was accidentally killed on July 9th, 1918, on his way to command No. 60 Squadron. Seventeen days later, on July 26th, 1918, Mannock failed to return from his last offensive patrol, after a little over three weeks in active command of a fighting squadron in France. His death occurred whilst engaged on one of those deeds for which he is best remembered.

"Have you got a Hun yet, Inglis?" said Mannock on the afternoon of July 25th, 1918. "No sir," replied Lieut. D. C. Inglis. "Well, come on out and we will get one," said Mannock. In the words of Lieut. Inglis: "It was about 5 p.m., and we walked off down to the hangars, got our engines warmed up, and Mick gave the signal to move off. Just as I started taxi-ing I discovered my elevator wheel was jammed . . . Mick didn't wait, and after circling once, set off for the lines." On Mannock's return he arranged to take Inglis out at dawn the next morning. "We got away at about 5.45 a.m., and my instructions were to sit on Mick's tail, and that he would waggle his wing's if he wanted me closer . . . The only thing I could do was to stick tight, as he was flying along the lines at about thirty to fifty feet up, and not straight for more than a few seconds, first on one wing tip, then on the other . . . Suddenly he turned towards home full out and climbing. 'A Hun,' thought I, but I am damned if I could see one; then a splitass turn and a dive, and there was Mick shooting up a Hun two-seater; he must have got the observer, as when he pulled up I came in under him, and didn't see the Hun shooting. I flushed the Hun's petrol tank and just missed ramming his tail as he came up. Dropped in behind Mick again,

and we did a couple of circles round the burning wreck and then made for home. I saw Mick start to kick his rudder, and realized we were fairly low; then I saw a flame come out of the side of Mick's machine. It grew bigger and bigger. Mick was no longer kicking his rudder, his nose dropped slightly, and he went into a slow right-hand turn, about twice, and hit the ground in a burst of flame. I circled at about twenty feet, but could not see him, and as things were getting pretty hot, made for home and managed to reach our outposts with a punctured petrol tank."

Wing-Commander G. B. A. Baker, M.C., who was one of Mannock's flight commanders, says: " Perhaps there was no greater loss, both from a war and peace-time point of view, for Mannock was exceptional in that he was above all a leader, and many as were the aircraft he himself shot down, he secured to others success which they would never have attained except through the agency of his leadership. There was often great difficulty in bringing enemy single-seaters to battle. Direct methods led to their retirement; their approach to the line was timed when patrols had gone home or were in another part of the sector. To ensure contact called for foresight and thought. Often Mannock would work for half an hour or more, his patrol blindly following, to get east of an enemy formation, and so force battle; never except to rescue some overwhelmed formation would he attack without the greater advantages in his favour. Rapid, yet thorough appreciation of the situation preceded every move. Of a nervous and imaginative temperament, he grasped the situation, summed up every factor, laid his plan of action, and allowed nothing to interfere with it. Secure in the loyalty of his followers, who had implicit faith in his leadership, who knew that both success and safety lay in keeping close to him, he raised air fighting and team work to a higher level than ever before, and deserves to be recognized as the greatest leader the Flying Services produced. Diffident to his own merits, never exaggerating his own achievements nor making claims of a doubtful nature, his record is in danger of being lost, and his example obscured by that of the more striking individualist. Those who were privileged to meet and work with him will, however, never forget what is owing to him."

The number of enemy aircraft definitely credited to Mannock as destroyed was thirty-five—an individual total only exceeded by those of Bishop and McCudden.

According to the *Gazette* of July 18th, 1919, when the posthumous award of the Victoria Cross to Major Mannock was announced: " This highly distinguished officer during the whole of his career in the Royal Air Force was an outstanding example of fearless courage, remarkable skill, devotion to duty, and self-sacrifice, which has never been surpassed."

MEMORIES OF A FAMOUS FIGHTING PILOT

BY FLIGHT-LIEUT. F. BOYD CRAWFORD, M.B.

" I know now what a brave man is. I know now how men laugh at death and welcome it. I know now why Ball went over and sat above a Hun airdrome and dared them to come up and fight with him."—
From " War Birds," diary of an Unknown Aviator.

THE name of Capt. A. Ball, V.C., D.S.O., M.C., will always be indelibly associated with No. 56 (F.) Squadron, and this bond of union has been rendered even closer by two relics of extraordinary interest which the Squadron has recently been fortunate enough to acquire.

Through the kindness of Sir Albert Ball, the Squadron is now in proud possession of a magnificent clock mounted on a portion of the propeller boss belonging to the S.E.5, in which his son waged his last combat in the neighbourhood of Annoeullin (north of Lens). Local villagers removed portions of the wreckage as souvenirs of the famous pilot, and Sir Albert had a difficult task in endeavouring to trace these melancholy fragments. Eventually, by good fortune, he unearthed, and through the good offices of a French parish priest obtained, the propeller boss on which the clock is mounted.

The second item is the engine and aeroplane log books belonging to the same S.E.5 and presented to No. 56 (F.) Squadron by the Courtesy of Wing-Commander T. B. Marson (retired). The latter was Recording Officer attached to the Squadron during the War. The log books in question are in an excellent state of preservation, and make extremely interesting reading.

The first six pages or so of the aeroplane log book are as follows :—

AEROPLANE LOG BOOK (S.E.5 A/4850).

15/3/17.—Machine delivered direct to 56 Sqdn. R.F.C. London Colney from Royal Aircraft Factory. Machine erected after wind-screen taken off and three ply fitted in place of same. Avro wind screen fitted. Water and petrol tanks fitted inside centre section plane. Top tank taken off, controls to tail planes altered, seat (adjustable) taken out and wooden one fitted in place. Vickers gun taken off and c.c. gear. Lewis gun fitted to fire through bottom of fuselage. Bristol wheels fitted in place of B.E. wheels. Fuselage made more stream-line, new petrol tank fitted. Tested O.K. Machine taken by air to Caudes. Lewis gun taken off and Vickers gun and c.c. gear re-fitted. New wind screen and Spad exhaust pipes fitted.

And as

R. F. C.

Capitain B a l l am 7.5.17 in Luft=
kampf mit ebenbürtigem Gegner gefallen.
Er wurde in A n n o e u l l i n beerdigt.

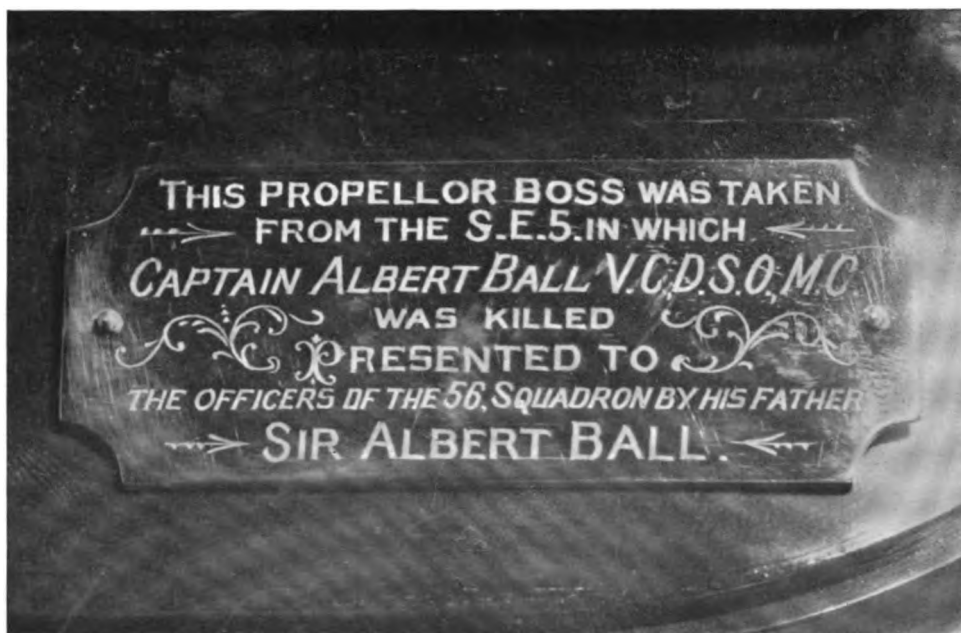
The message dropped by the Germans informing 56 Fighter Squadron of the death of Captain Bail.

REPAIRS	REMARKS
Machine taken by air to Presidio	Time in air since last overhaul } <u> </u> hrs. <u> </u> mins
Lower Gun taken up (Parker) gun and in gear adjusted new wires & screws and spent exp. and paper filled By Ep. Gibson	
24-4-17 New Shock absorbers fitted and control inspected by Ep. Gibson	
22-4-17 New Wheel L.H. fitted By James Parker M. S. Laidy - 8-32	
Machine damaged in air fight	" " " Since Purchase 17-17
New centre section fitted New R.H. by Ep. Gibson	
Top Pulver. Rear outside R.H. Street	
Bullet holes packed in fuselage	a Ball Capt N. H. C. V. of flight
By Ep. Gibson	56 Ep. Gibson
24-4-17 New brought down on St 52830	

The most interesting page of Captain Ball's Log Book.



The clock mounted on the propeller boss belonging to the S.E.5 Aircraft in which Captain Ball was killed.



- 21/4/17.—New shock absorbers fitted and controls inspected.
- 24/4/17.—Machine damaged in air fight. New centre section fitted, new R.H. top plane. Rear outside R.H. strut . . . bullet holes patched in fuselage.
- 24/4/17.—1st Hun brought down on S.E.5. A/4850.
- 26/4/17.—M/C. damaged in air fight. New centre section fitted, new star. bot. plane, aileron patched and bullet holes repaired. Test O.K.
- 28/4/17.—New starboard wheel fitted. M/C. damaged by H.A.A./cft. controls shot away. Dismantled and sent by road to No. 2 A.D. with all instruments, Vickers gun and c.c. gear and Lewis gun mounting.
- 29/4/17.—Recd. in Salvage Dept.
M/C. partly dismantled and O/hauled. 2 new spruce longerons fitted to rear portion of fuselage R and L hand bottom. New cross member in fuselage, also 3 ply fitted to end of fuselage. 3 ply behind seat. Complete set main struts. Six fuselage bracing wires. Also complete set of new controls, except ailerons. M/C. erected and trued up. Fitted Vickers G.206. Loading handle. Fitted c.c. Gun Gear. Timed and adjusted gun. Tested O.K. at butts. Connected copper pipes and fitted cowling. New gun slide fitted, gun mount fitted, M/C. not tested at A.D.S. Taken direct by Capt. Ball to 56 Sqdn.

Ball's appearance was striking. "Of medium height, sturdily built, with a mass of black hair, a fresh complexion, with deep-set, piercing, dark eyes—rather a Red Indian type of countenance. He never wore goggles of any sort when flying, and his hair used to stand straight up and add to the vividness of his appearance."* It is interesting to learn that this famous fighting pilot was a teetotaler, a non-smoker, and that next to flying his greatest passion was gardening.

Among the many stories that have gathered round his name there is one that well illustrates that quality so essential to the lone fighter—resource.

One day Ball, perceiving two enemy machines in the distance, at once engaged them. Hardly had he opened fire when three Hun planes of a new and fast type emerged from their hiding place in a cloud to devour the victim who had fallen so easily into the trap. Outnumbered and outpaced, Ball fell back on his ingenuity, and making a forced landing in the nearest suitable field he drooped realistically out of his cockpit. The enemy, after a preliminary inspection, landed in

* Quoted from "Scarlet and Khaki," by Wing-Commander T. B. Marson.

the same field—to capture the famous pilot would, indeed, be a feather in their caps. Whereupon Ball, who had kept one eye open and his engine running, opened his throttle and took off over the heads of the astonished and infuriated Boches.

To multiply such stories would be easy; they cluster thickly around what is fast becoming an almost legendary figure. But such tales, whatever their transient interest, tend to obscure in a kind of verbal fog, and to invest with an air of unreality, the personality of the individual concerned. I will therefore content myself with briefly recounting the known facts regarding Ball's last fight.

Information had been received that numerous German planes were operating with apparent immunity over the front-line trenches in the neighbourhood of Arras, and it was thought that they were probably Richthofen's Circus (known to be in this area at the time). Major Blomfield, who was then commanding No. 56 (F.) Squadron, after personally inspecting the area in question, obtained permission to attack the "Circus."

At six o'clock on the evening of May 7th Ball set out for the neighbourhood of Arras, leading ten other machines. The Squadron, on nearing their objective, ran into cloud, the individual members lost touch, and the formation disintegrated. At this critical juncture they were attacked by Hun planes, and there ensued the usual running dog fight, with every pilot fully engaged in defending himself. Only three machines struggled back to the aerodrome that night, and it was some hours later that it was learnt that three more machines had forced-landed on the return trip. The remaining machines arrived the following day, but without Ball.

Day after day slid rapidly by with no news as to the fate which had befallen him, and it was not until the end of May that the Germans dropped the following message:—

"Captain Ball fell on 7/5/17 in an air combat with an opponent of equal skill. He was buried at Annoeullin."

Wing-Commander Marson states that he very much doubts the veracity of this message for two reasons. Firstly, a member of the Squadron (Capt. H. Meintjes, M.C.), during a momentary lull in the fighting saw Ball's machine heading in the direction of Lens, and from the way the plane was handled felt sure that Ball himself had been hit. Secondly, a certain Capt. Hunter, lying wounded during May in a German hospital near Lens, was shown Ball's identity disc and informed that the famous pilot had been brought down by anti-aircraft fire.

While the odds are against the problem ever being definitely settled, one is inclined to agree with Wing-Commander Marson's opinion: "That it would only be in keeping with Ball's character to refuse to

quit the scene of the conflict, and thus to have fallen a victim to his foes on the ground. In the air he was supreme."

The author of this article desires to express his thanks to Squadron-Leader H. V. Rowley (Officer Commanding No. 56 (F.) Squadron) for facilities given to examine and photograph the log books, etc.

Since the above article was written further confirmation of Wing Commander Marson's theory has unexpectedly come to light.

I am informed by Wing-Commander R. G. D. Small that he saw a great deal of the front south of Lille at a period subsequent to Captain Ball's crash, and that he was shown his grave by a German peasant. A little later he was lucky enough to discover among prisoners taken on this sector a Saxon who had actually taken photographs of Ball's machine after its final landing.

According to this German informant (a fine type of man who, incidentally, spoke excellent English) Ball was probably making for Seclin with his machine badly damaged by anti-aircraft fire, and chased by enemy planes. He landed between Seclin and Carvin at a spot about ten miles south of Lille, but in such a badly wounded condition that he died the following morning.



SUAKIM: THE SKELETON PORT OF THE SOUDAN

BY JANE PURVES.

FIVE restful days in the still lagoons about Suakim were a welcome interlude in the hot trip up the Red Sea a few summers ago. Curiously enough, the *Shimal* had failed, and a smothering following wind had kept us simmering in ill-temper as warm gusts of smoke and smuts whirled down upon us.

Suakim lay dead in the trembling heat of late afternoon as we anchored. Skeleton walls of storehouses and barracks built in the eighteen nineties for Kitchener's troops in the Soudan War stood crumbling away at the very edge of the sea, bleached by a thousand tropic suns. All trade nowadays, save only that of cotton, passes through Port Soudan a few miles to the north.

Early in July as it was, 128° in the shade was delightful in that pure air. An agent came off in a row-boat, two or three boatloads of chaffering natives drew round the cook's galley ports. A dhow a mile off was slowly lading cotton from the clustering roughly-built boats of the natives. By a sweep poled aft they drifted down heavy laden to the dhow over the ebb, but came back swiftly sailing, singing an Arab shanty. Their sails were of the simplest.

Two of the crew took off their nine-yards long jibbehs, tied one corner to each end of an oar, and hoisted it on a pole, cum-mast, cum-oar, in the bows, where the jibbehs ballooned like flying jibs in the Solent.

We went ashore to see over a cotton factory, being warmly welcomed by the two Egyptian owners, who rarely saw visitors, particularly feminine ones, during the nine months of each year they spent at the factory. It was all very interesting to see the machines that clean the fluffy bolls of seed and tick, but most interesting of all to note that not only was the machinery all-British, but that it had most of it been installed in the mid-Victorian era. It was still working faultlessly, and still unequalled by any other country, so that the factory owners were installing a new engine of the same fifty-years' old design.

While we sat in the darkened offices imbibing limers and each others yarns, the overseer came in to render accounts. The owners drew our attention to him in an aside. He was an Arab, thin, polite, in spotless under-robe and usual brown 'aba and checked chéfah of everyday, but the sweetness of his expression, his clear-cut features and the general quality of the man stood out in a remarkable way from his more odoriferous fellows. A painter would have found him an ideal model for the Christ. His account was right to an anna, and he withdrew gracefully with many salaams.

"That man is the most extraordinary worker I've ever had," the factory owner told us. "He has never done me out of a rupee, never bullied or kicked any of the hands. They all obey his slightest wish or hint much quicker than any command I shout at them. He doctors them, he sees that the bazaar folk never overcharge them. His work for me is perfect, and if I had to replace him, I'd need two. I'd say he was an old Prophet re-born, only he works too hard." A visit to Suakim is recommended to those plastic artists who paint the Christ with chunky limbs and degenerate features.

We went on to tiffin on a huge veranda overlooking the dazzling lagoons. It was rather difficult to find our way across to the table, for a friend of our host had just come down from a season's big game shooting in the Soudan. Much of his gear and bales of his specimens cluttered the floor so that it was rather like climbing Mount Arrarat to get there. Many of the rarer animals are protected, but each gun may still bring down one Giant Eland and a white rhinoceros. Our fellow guest had been shooting over the Sudd, those hundred leagues of dismal papyrus stretching north of Khartoum, working down from a winter on the Upper Nile where the bird life was so varied and interesting. He had collected specimens of the sabre-horned Oryx Leucoryx, a Tiang, kodoo, waterbuck, hartebeests, ibex, warthogs, etc.

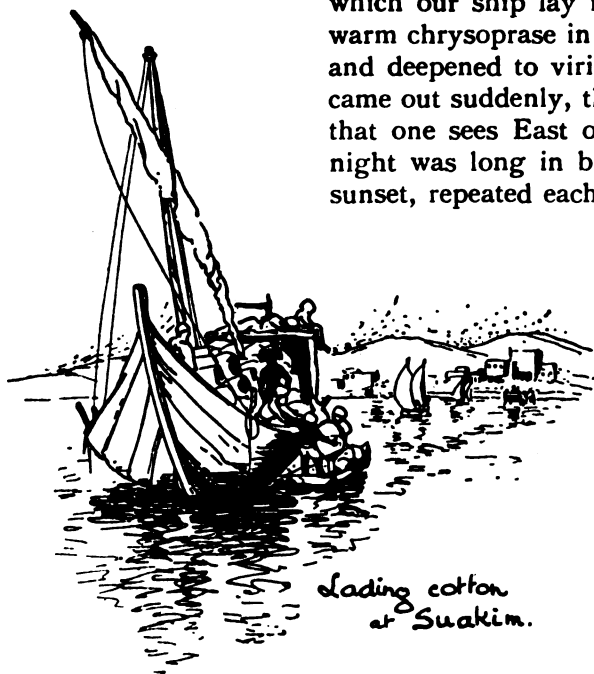
One interesting point that he mentioned was that stalking was really quite easy in the Sudd, in spite of the masses of papyrus and occasional fan reeds. There were often stretches of water opening in the reeds along which a kind of punt could nose its way, and the animals were

not used to the long-distance rifles which scarcely a native in the Soudan possessed. Animals have not yet got the true range of the long-distance danger zone, and good shots are easy.

Our ship was lading cotton bales when we went on board again, a fine specimen of a Fuzzy-Wuzzy being in command. His well-oiled black skin shone like ebony, and ever and anon he applied those ivory instruments, stuck ready in his bush of hair, to the purpose for which they were made. His dagger had a businesslike air about it, and his swagger was immense, as well it might be, for his tribe, the Haden-dowa Arabs of the Red Sea Hills, were practically the only people able to break through a British square, at El Teb and Tamai, which these ruffians never forget.

The peace of the desert settled on the lagoon as the last crew sailed home. A distant crane stood one-legged in a pool until the last gleam of light failed, though none saw him catch anything. Two camels drifted down to munch camel-thorn growing on silted mud-banks. A solitary fisherman put out in a frail canoe, leaping over-board upon his fish as soon as hooked. His splash, as he dived, was the only sound on the water, except the muted concertinas of our crew having a sing-song for'ard.

The sun went down, a flame of burning orange behind the purple hills of the Soudan. A wonderful green flooded the sky, reflected in every pool and ripple of that glassy stretch on which our ship lay motionless; a green that was warm chrysoprase in the west, pure emerald above and deepened to viridian in the east . . . Stars came out suddenly, the myriad multicoloured stars that one sees East of Suez, but the blackness of night was long in blotting out the magic of that sunset, repeated each day of the ship's call.



PHOTOGRAPHY AT ASSUAN

BY FLIGHT-LIEUTENANT C. K. J. COGGLE.

HOT and tired, we landed at Assuan, Pat and myself looking forward to a week or so of hard work. We had been fortunate enough to be the pilots selected for an interesting and an unusual job of work.

It was the beginning of April, and the thermometer was beginning to rise rapidly. The Egyptian Government had decided, if practicable, to raise and strengthen the dam at Assuan. The first necessity was a survey to ascertain the extent of the country that would be flooded. The Survey department being modern in their ideas, decided to try out a survey by air. So here were Pat and I, and a Photographic Officer with a party of airmen about to try and photograph some 125 miles of the Nile and surrounding country.

We were received on the landing ground by a native police officer, Lieut. Bayoumi, who made us heartily welcome and practically gave us the freedom of the town.

The landing ground consisted of the only patch of fairly level sand within a considerable distance. It was surrounded on three sides by hills about 100 feet high, and a railway ran along the fourth. The only buildings were a petrol store, surrounded by barbed wire, and a hut made locally for the gaffir (native night watchman). There was no shelter for the aircraft (two D.H.9a's), and very little for the personnel.

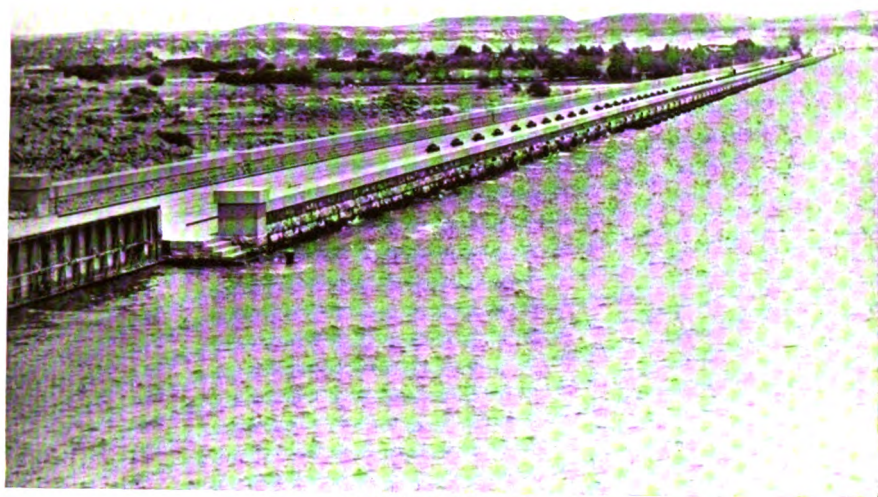
After picketing the aircraft securely we made our way down to the town of Assuan in a decrepit Ford with a very indifferent driver (native), and incredibly hard seats. The road from the landing ground is not a road at all, but merely a track used principally by the Bishareens (a wandering tribe who come into the towns about twice a year to sell and exchange their goats and camels. It is from these people that the majority of the fleet racing camels are obtained). We arrived at the Grand Hotel, rather stiff and sore from our five-mile drive, eagerly anticipating a long, cold drink. We were the only Europeans in the hotel, and, as we afterwards found, the only English people in the town with the exception of the Bank Manager and his wife.

Then came the job of arranging the flying duties. The photographic officer was a law unto himself and went his own way. We both knew the country round, and the thought of flying over it as a habit was not a pleasing anticipation. The part we were about to survey was the worst country through which the Nile flowed between Khartoum and Alexandria. The banks of the river were steep and rocky, and

vegetation was practically non-existent. Further inland, where it was not undulating soft sand from which it would be impossible to take off, the ground was composed of rocky outcrops and boulders with a few rock hills dotted here and there to make things more difficult. We were told, and believed, that it would take a matter of days for camels to reach an aeroplane that forced-landed any distance away from the river. However, as we were to take photographs from a height of 10,000 feet, we considered that we should be able to reach one or other of the few patches of flat sand that existed, so we did not worry about any possible need of medical aid in case of a crash after forced landing. That left only the question of food, and (more important still) water. We decided that under the circumstances we would have to take with us three days' food ration and five days' water as a minimum. Then a horrible thought flashed through our minds. Would a D.H.9a with all these rations, pilot, passenger, a heavy camera and plates get to a height of 10,000 feet and stay there until 10 or 11 o'clock in this hot weather. The light was not good enough for photography before 8 a.m. There was nothing for it but to try the next day; at all events it meant that the start would have to be made at dawn. We decided that only one aircraft should be in the air at any one time, and only if the other was serviceable. We only arrived at this decision after much thought and discussion with the local police. It must be remembered that there are no telephones or telegraphs in the desert, and if either of us forced-landed it might be days before the aircraft was found (unless the other could search from the air). We had only two aeroplanes, and limited material and opportunities for repair, and it would be extremely unpleasant for both aeroplanes to be forced-landed at the same time, or for one, to be unserviceable on the landing ground while the other was down somewhere in the "blue." As things turned out, we were wise.

Iron rations, consisting of eight gallons of water, tins of bully beef, ration biscuits, tea and sugar, were carried in each aeroplane, augmented by chocolate and chewing gum. In addition we made the following purchases, which were carried in my aeroplane: 1 tin asparagus, 1 tin lobster, 1 large tin of tongue, 4 tins sardines, 2 packets of cream cracker biscuits, 2 small tins of butter, 4 small tins of condensed milk, 1 jar of patum pepperium, 1 bottle of lemon squash, 4 bottles of beer, 1 bottle of whisky, 1 flask of brandy, 2 small tins of fruit salad, 1 tin-opener, 1 bottle-opener, 1 pair of scissors, 1 jack knife, 2 plates (enamel), 2 mugs (enamel), knife, fork and two spoons.

It sounds a lot to carry about in one aeroplane, but if the reader has ever forced-landed and lived in the middle of a vast desert in summer for two or three days with nothing to eat and drink but bully beef, biscuits and water, he will appreciate the necessity for some such



THE ASSUAN DAM.

This photograph shows the extraordinary length of the dam, and gives a good idea of the character of the surrounding country.



THE ASSUAN DAM.

The accuracy with which the dam was built can be seen from the above photograph. The houses and gardens of the English officials can be seen in the top of the photograph.

extra rations. I have on several occasions had cause to be thankful for my extra food, and it was bitter experience that taught me the necessity for it.

The ordinary radiator on a D.H.9a was not big enough for flying in hot countries, so an extra radiator was fitted under the nose of the aeroplane. This increased the weight by the amount of water and weight of material, and also increased the head resistance. In addition, we had fitted extra petrol tanks on the wings, which extended our endurance to approximately seven hours. A heavy camera and a load of photographic plates aggravated the difficulties under which the long-suffering D.H.9a laboured.

After a comfortable night in the best rooms in the hotel, we started off just before dawn for the aerodrome. Our route took us through the town of Assuan, along the broad main road, with houses on one side and the Nile on the other, and along tortuous winding streets, now mysteriously quiet, but in a short hour to be noisy, crowded thoroughfares, past an extensive native cemetery, and then into the open desert, with narrow strips of cultivation surrounded by hills that looked dark and impressive in the half light. We arrived at the aerodrome just as dawn was breaking, the scenery on the open side being magnificent. The sky was tinted with pink, and the tops of the hills were just touched with the sunlight, while the bottom of the range was in deep shadow, with just a suggestion of mist in the valleys.

Pat and I tossed a coin, and it was decided that I should do the first trip. The engine was started and all was in readiness, but . . . no photographer! We waited, at first patiently, and then impatiently; at the end of an hour the sun was well up in the sky, we were nice and warm, both internally and externally, and the engine had been stopped to cool down five times! Still he did not come, and we were talking over the things we would do to him when he appeared with a bright and happy smile, and a "Well, here we all are, bright and early . . ."

We got off eventually and started to climb, and oh! that poor old Ninak! I thought it would blow up at any moment, but in the end we got to 10,000 feet and took some good photographs, but I had to keep the engine at nearly full throttle to maintain the height.

All went well for three days. We worked in the afternoon from 4 p.m. until dark and only flew in the morning, not only because the light was insufficient in the evening, but because it was too hot for the aeroplanes to get to 10,000 feet in the afternoon. We estimated that we would finish the job in a week, all being well. Unfortunately, everything was not well, for on the fourth day Pat forced landed. He started off at six in the morning, and he should have been back by 10 o'clock. Ten o'clock arrived, but no Pat. I gave him an hour,

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and then started off to look for him. After flying for half-an-hour I saw him on the only good patch of sand within a radius of twenty miles. I landed beside him, and found that his engine had seized whilst he was trying to get to 10,000 feet. He had been there since 6.30 a.m. indulging alternately in bad language, and thankfulness that the other aeroplane was available to look for him. I left him my only tin of asparagus and two tins of sardines and flew back to Assuan to collect bedding, extra food, means for boiling water, some ice, and a couple bottles of beer, which I took over to him, and so earned his eternal gratitude. I then sent a telegram to Headquarters in Cairo and asked for another engine and some mechanics to be sent down by air. They arrived at Assuan in a Vickers Victoria the following day, and were flown over to the forced landing the morning after. We set to work, and by two o'clock that afternoon the new engine was installed and run up for a ground test. We all flew back to Assuan that same evening—a good day's work!

The next day was Sunday, and as the men had worked so well and uncomplainingly out in hot sun, we proclaimed a holiday. Lieut. Bayoumi, who all this time had been most useful and helpful to us, called at the hotel on Sunday morning and asked us if we would like a day on the river in the police launch. Nothing could have been more attractive, so we accepted the invitation at once. It was arranged that the police launch would be ready for us at the landing-stage near the hotel at 11 a.m. We came out of the hotel just before 11 o'clock to find a crowd of at least two hundred natives outside the hotel, with a narrow way leading from the hotel steps to the landing stage. They were silent, which made us extremely embarrassed, but we managed to hide it fairly well, although I have rarely felt so self-conscious. However, we arrived safely at the landing-stage and commenced to board the launch when suddenly Lieut. Bayoumi produced a large bunch of flowers and presented them to me! Immediately the assembled natives let out a yell and started clapping and cheering. The launch pushed off, and we settled down to an enjoyable day. It was most interesting to see the country from the river that we had observed from the air, and after trying once or twice to walk inland for a mile or so, we were again thankful that we had decided to have one serviceable aeroplane on the ground while the other was flying. We were taken to see Philae and Pharaoh's bed, and all the local places of interest. While passing one village we saw crowds of women lining the river bank, but not a single man. We found that this particular village was composed entirely of the wives of native servants in lower Egypt. They spend practically all their lives there and find a means of livelihood by fishing. Their husbands come and see them once a year for a fortnight or so; more often if they can.

They appeared to be quite happy and very cheerful, although sometimes, I understand, they have the most terrible fights, in which anything from 25 to 50 women take part. We then went over the Assuan Dam itself. This is a marvellous piece of engineering, and is most impressive. It is approximately a mile and half long, and looking along the edge you can see that it is dead straight, it is in fact not one inch out of true for the whole length. We landed at one end of it, where there were several houses, surrounded by big shady trees and beautiful flower gardens, in which the English officials live. We were introduced to them and found them all most charming; they were particularly interested in our photography. One of them wanted copies of some of our photographs, and wrote to me at the Grand Hotel asking for them. He addressed his letter to: "The Dam Flying Photographers," Grand Hotel, Assuan.

During the afternoon I complained bitterly to Lieut. Bayoumi about the low standard of the local taxis. He immediately offered to loan us two of his police ponies for the duration of our visit. Pat, being a good rider, immediately jumped at the idea and accepted before Bayoumi could change his mind. I was not so keen, until I remembered that the only police ponies I had seen had been either standing still or walking very slowly and sedately. That thought cheered me and gave me confidence which became greater on receiving the assurance of Bayoumi that he would produce a particularly quiet pony for me. I, too, therefore gratefully accepted his offer. The next morning we were met by Bayoumi on the doorstep of our hotel, his face wreathed in smiles. He assured us that two quiet ponies were waiting for us. On seeing them, my heart dropped—two fire-breathing, stamping Arab stallions, being held with difficulty by two grooms. I was about to refuse indignantly to ride, and order a taxi, when I happened to glance round and saw Bayoumi and some other native police laughing behind their hands and thoroughly enjoying my discomfiture. That settled it, so with as much dignity as I could muster I mounted. A clatter of hooves, a rush of air, and I realized I was travelling at full gallop! Eventually, by brute force, I managed to turn its head in the general direction of the aerodrome, and settled down to holding myself on. After a little while I found that the movement was rather pleasant, and there was very little difficulty in keeping in the saddle. I soon became accustomed to it, and after a few days I thoroughly enjoyed the early morning gallop. This was not all the excitement for that day, because when I arrived at the aerodrome and managed to stop my mount, I saw several natives with large sticks and two with spears busy searching for something. On making inquiries I found out that they were looking for a snake, the horned viper of the desert, which is extremely poisonous. I immediately

had a quick glance round me, but seeing nothing, I joined in the hunt. We traced one to a hole in a large rock, and the natives told me that there would be at least a dozen inside. As the place was quite near the small shelter we had erected, I thought it would be as well to get rid of them if possible. Pat, arriving on the scene, immediately produced a bright idea. We sent a native for a tin of petrol, and poured some down the hole; we then led a trail of petrol to a distance of about thirty yards, and set it alight. A cloud of smoke and flame shot out of the hole, and also out of several other holes that we had not previously noticed. This suggested to me that some of the snakes might have escaped while we were laying the trail of petrol. We had another search, and sure enough we found and killed two fine specimens. We did not see any more snakes the whole time we were there, for which we were very thankful.

The next day Pat said he would like to try again to take some photographs, so off he went at 6 a.m. Passing the aerodrome during the morning, I noticed great herds of goats and camels, and driving them, a family entirely different in appearance from the local inhabitants of Assuan. They were finely built, and of a dark brown colour, with masses of fuzzy hair, and these, I was informed, were Bishareens, of which there is a small floating population in the outskirts of the native part of Assuan.

I noticed that two of the men were carrying long swords, with a cross-bar hilt, in a peculiarly-shaped scabbard. The scabbard was narrow until near the end, when it broadened out and looked rather like an inverted spear. I asked Bayoumi if I could examine one, and he sent for one of the Bishareens to come over. On examining the sword I found that it had all the appearance of being a genuine antique, and it reminded me strongly of the pictures I had seen of Crusaders' swords. I immediately wanted to buy it, and asked Bayoumi if he would buy it for me. For a long time the Bishareen refused to part with it, and it was not until, as I afterwards found out, that Bayoumi asserted his authority as a police officer, and threatened to put the wretched man in prison for two years, that he at length grudgingly accepted £1 for the sword. I was highly delighted with my purchase, and was anxious to have an expert opinion on it because I was certain it was very old. I was right, and this is what happened. That same evening Bayoumi and two Bishareens called on me in my hotel, and after much shame-faced apologizing and beating about the bush Bayoumi said that the Bishareens had been to the Mudir (the native governor) and Bayoumi had got a very severe rap over the knuckles, and would I be kind enough to give back the sword. I did so with many regrets, and received back my money. I determined to ask the Mudir what it was all about.

Once again I had cause to worry about Pat, and at last I decided to look for him. Sure enough Pat had forced-landed again, but this time near the river on a fairly good patch of ground, which was, however, very soft in places. When I landed near him I saw, to my utter surprise, another man with him, busily engaged in eating up Pat's tinned foods. He was heavily bearded, and clothed in some of the most ragged clothes I have seen for a long time, but he was, nevertheless, an Englishman. It appeared that this man had a small gold mine just outside El Alagi. He worked practically by himself for about two years, until he had collected enough gold. He then went home to England, and lived most royally for about six months, until all his money was gone. He had been doing this for some ten years, and appeared thoroughly to enjoy his method of life.

The petrol pumps in Pat's aeroplane had failed this time, and so I flew back to Assuan and collected two spare pumps and a mechanic and returned to El Alagi. It was only a matter of a couple of hours or so before we were back again at Assuan.

By this time our tame photographer was beginning to get worried about the temporary stoppage in the supply of plates for him to play about with. He had already printed those he had five times, and he began to feel that he would like some fresh scenery. He came along that evening to the aerodrome, and asked why we had not taken any photographs that day. I told him about Pat's forced landing, but he calmly asked why I had not taken the photographs. I patiently explained it all to him, and he said that in his opinion I ought to take a chance because that was what I was paid for. I agreed to go on condition that he came as passenger to take the photographs, but unfortunately he had had trouble with his ears ever since he was a boy, and even now they were very painful at any considerable height. So we waited until both aeroplanes had been given a good overhaul.

The next day I called on the Mudir. He was very pleased to see me, and I found him a most courtly, polished gentleman. We had innumerable cups of coffee, after which he took me over the government buildings and introduced me to the Hakemdah (the chief of the native police, and Bayoumi's commanding officer). My prestige went up in leaps and bounds when both the Mudir and the Hakemdah bowed politely and saluted me at the door of the government office, having actually condescended to escort me to the street. I noticed a new respect in the attitude of the natives towards me, and congratulated myself on a wise move. While talking to the Mudir I asked him about the Bishareen sword, the memory of which was still causing me many longing regrets. He explained that these swords, of which there were not many, were very old—he said about 400 years old—and had been in the tribe so long that no one could remember when they first

made their appearance. In time these swords had become priceless treasures to these people, and now only the chief's sons were allowed to carry them, and they were looked on as heirlooms. Bayoumi's high-handed action had, in a few hours, caused such a feeling of unrest that the Mudir, on finding out the trouble, had immediately instructed Bayoumi to get the sword back from me again. The Mudir assured me quite solemnly and convincingly that a tribal war had only been averted by my handing back the sword.

The next day the Mudir invited us to dinner, at which we were most surprised to see his wife, a Syrian lady, present, unveiled and dressed in a smart and fashionable Parisian-looking frock. We were most embarrassed, as neither Pat nor I had the slightest idea how we should behave. However, the Mudir made us fairly comfortable by saying in confidence that he was very occidental in his ways, and knew that we had our wives with us when guests came to dine. Still, we were glad when this attractive lady left us, as her English was nil, and our Arabic very little better, and nods and smiles might be easily misinterpreted. However, our social success was now complete, and invitations showered on us thick and fast. One dinner at the Egyptian Army Officers' Mess remains firmly in my memory. We were asked whether we would like English or Arab food. We said we would like Arab food, and the meal began with what looked like Spinach in oil. I caused a lot of mirth by taking a large spoonful and nearly returning it to my plate. It was extremely rich, and practically pure oil, and the correct way was to dip bread into it, and then eat the bread. I determined after that to wait until my hosts had started. The next course came. It was a whole roast lamb, and smelt delicious. I was thinking which part to ask for when the officer next to me whispered that as the honoured guest I was about to receive the most prized tit-bit. I waited expectantly, and was presented with . . . the eye!—which was handed to me in the President's fingers. I could not help shuddering, but fortunately they all laughed and, after much persuasion and chaffing, eventually decided to excuse me from eating it, for which I was truly grateful. At subsequent functions we always asked for English food.

A visit to our photographic officer's establishment well repaid us for our trouble. He was really an expert at his job, and in taking prints of the plates he had allowed for distortion caused by the aeroplane not being quite level when the photograph was taken. When we walked in we saw what at first looked like a large snake, but which turned out to be a large number of prints pinned together.

We had decided that as the Nile was very winding just where we were to photograph it, we would save time by not doing the ordinary Mosaic by means of a series of straight runs, and instead to follow

the course of the Nile, and fill in where necessary with extra runs. Had everything gone satisfactorily as far as the aeroplanes were concerned, we could have finished the whole thing in a week, but as things turned out it took us the best part of a month. At the end of a fortnight there only remained about 20 miles of the southern end of our area, and two parts each about ten miles long to be photographed. Pat had not as yet taken a single photograph from the air, and was getting more and more desperate as less and less of the area remained to be photographed. So off he went again, and I thought that at last we would manage to get some results. Alas! Within half an hour he was back again with his thermometer registering 100°C. , and very little water left in the radiator. I was by this time beginning to tear my hair, and to make things more enjoyable, a polite, but, as it seemed to me, a gently sarcastic telegram arrived from Headquarters asking me to give the estimated date of my return. I sent them a letter explaining the difficulties under which I was labouring, and I was left in peace. As soon as Pat's aeroplane was serviceable, I lent him mine to try his luck again. He gave me a fright by arriving back half an hour late, but he had taken some photographs. Greatly excited we went to the photographic officer's house that evening, and immediately on arrival Pat was presented with an enlargement of the first photograph he had taken. That completed our job, and it only remained to bid farewell to all those who had been so kind to us, and return to our home station.

The Egyptian Survey Department wrote a very nice letter saying that in just over three weeks we had given them more information than could have been obtained in eighteen months by ordinary means.

A CHEERY WEEK-END

By PETER FERRERS.

I.

SOME thirty yards or so out from the sea wall, a long narrow sampan was lying motionless, with the blue sunlit water making little slapping sounds against her sides. The two oarsmen leaned silently upon their clumsy sweeps awaiting the cast of the net-thrower standing in the prow. The latter's perfectly proportioned, brown-tanned body, naked save for a loin cloth, was vaguely reminiscent in poise and expectancy to some bronze Greek statue. As he made his cast, and the great net flung out fanwise against the blue sky, his unconscious grace of movement was emphasized by the stolid heaviness of the other two members of the sampan. Their faces of flat placidity, beneath great cart-wheel conical hats, were a foil to the thrower's flashing teeth as he made some unintelligible remark and shook, with a bird-like gesture, some tiny drops of salt water from his shock of black hair.

Farther away, towards the hulk of an old steamer driven ashore in a typhoon some years ago, a forest of masts arose from a number of junks anchored like a small city about the end of the rickety pier, running out near the Police Station into the waters of Kaulung Bay. From their high, square-shaped sterns little wisps of blue smoke, curling upward against the morning air, indicated that cooking was in process, though the only other sign of life was a very small sampan, propelled by a single scull in the hands of a tiny Chinese girl, upon whose back was strapped an even tinier Chinese baby. The necessarily short strokes of a little oarswoman gave the sampan the appearance of some insect darting about the surface of the water.

Beyond the junks lay the flat peninsula of Kaulung, and rising in the sky, still farther south, could be seen the blue green precipitous slopes of Hong-Kong Island.

The seaplane, slung beneath the crane upon the sea wall, was a picture to delight the eye of the beholder. Her shining silver wings, with their red, white and blue markings, spread in a graceful span to cast a black comforting shadow from the hot sun; her long tapering float, ivory enamelled and gleaming brightly; her aluminium engine cowlings, polished until they shone like burnished mirrors; her white painted struts and wires and the whole of her silver fuselage, from propeller boss to rudder streamer, were the culminating acme of beauty from a pilot's point of view.

Her own pilot, arrayed in the customary uniform of the R.A.F. officer in the Far East, which consists of khaki shorts and a shirt open at the throat, surveyed her with pride. He had just completed (in defiance of regulations) the fixing to the cowling of a mascot, in the shape of a small Chinese buddha. It sat in front of the pilot's wind-screen, pot-bellied and smiling, while the pilot and crew of the seaplane stood beneath, with heads on one side, examining the effect with the critical air of art connoisseurs.

"Right!" said the pilot at last. "I think that'll do nicely. Tell the flight-sergeant we're standing by to start up at ten-thirty, and the baggage, which should be along shortly, is to be stowed and made fast in the after cockpit as soon as it arrives."

As he struggled into his tunic, one of the Officers' Mess "boys" came down the tarmac, followed by a coolie, bearing across one shoulder a bamboo pole, from either end of which dangled a suitcase. Two more figures also appeared round the corner of the hangar, followed by the Flight Commander and a few airmen.

"Hello!" said the pilot. "Here's the C.O. already, all dressed up half an hour too early. Have that baggage stowed now, Potts; I expect he wants to get away sooner for some reason." He saluted as the two figures approached.

"Morning, Peter," said the C.O. "'Fraid I'm a bit ahead of schedule. I thought I'd like to have a look at that wreck over at Capsuimun before we meet Cabrale. It's all on our way."

"Good morning, sir. Yes, I think we can manage it; that is if you are prepared to start at once. Everything is all ready now."

His eyes moved caressingly over the seaplane. Surely, he thought, no man can resist her this morning. The C.O. nodded, as though understanding his unspoken thought.

"Machine's looking very nice this morning," he said. "That joss ought not to be there. Still, we'll leave it for this trip."

Peter blushed slightly.

"Thank you, sir," he answered, then, turning to the group of airmen:

"Right, Flight Sergeant. Start up, please."

The roar of the engine bursting into song awoke to echoes the hills surrounding the aerodrome, and the back draught from the propeller blew a blinding duststorm of fine sand along the tarmac towards the hangars.

Across the nullah, separating the aerodrome from the rest of the Chinese city, a crowd of nondescript Cantonese collected to watch the "*fikkishun*" or "butterfly men," as the Air Force is termed in the local dialect. There were rickshaw boys squatting on the shafts of their little carts, coolie women bearing great bundles of grass cut from the slopes of the surrounding hills to burn the bottoms of their junks and

sampans; there were one or two portly old Chinese gentlemen in long silk gown and little red-buttoned skull caps, accompanied by a following of female relatives of varying ages from six to sixty; there were the sedan chair coolies, smoking vile-smelling tobacco through long bamboo pipes, and there were the usual myriad children—dirty, noisy and semi-naked. A large black-bearded Sikh policeman, truncheon in hand, presided over the gathering like some benign influence.

Eventually, the engines having been run up and tested and the C.O. and his Adjutant, a large young man answering (occasionally) to the epithet "Hooch," ensconced in the two seats behind the pilot's cockpit, Peter raised his arm in a circular movement above his head, and the crane, with much puffing, lifted the seaplane and dropped her carefully upon the sunlit surface of the water, where she lay poised like a great swan with spread wings. Hooch clambered up on to the centre section and knocked out the pin retaining the crane hook, and the seaplane slowly taxied away past the sea wall into position for taking off.

Seafaring men and poets speak of the beauty of a fully rigged sailing vessel heeling, with wind-filled canvas, before a freshening breeze. More modernly they write of the power and grandeur of a battleship forging at full speed through grey Atlantic rollers beneath a dull leaden sky, symbolical of strength and majesty. Either way there are few scenes giving a delight comparable with a silver white seaplane taking off from a sparkling sunlit sea in a snowy smother of foam and wheeling gracefully as a seagull against a bright sky, turquoise blue and dazzling.

The group of men standing on the sea wall watched the seaplane turn into wind, then, as the engine was opened up, gradually gather speed with a fine feather of silver spray from the heels of her floats, faster and faster, until, suddenly, there was no more spray and the seaplane was in the air—her own element.

Peter felt the surge and lift of her, felt the tremor on the controls, so apparent on the water, cease as the air claimed her. It seemed as though the excitement of anticipation had given way to something calm and steady. He had a curious idea that the seaplane was somehow humanly loving it all—the air, the sea, the sun—and he, in his turn, felt the joy of flying. Looking back, he saw the widening track lines left on the blue water by their take-off—a tiny sampan rocked furiously as the rollers reached it—and presently he saw them break in little wavelets against the end of Kaulung Pier.

He flew towards the aerodrome and wheeled low in a vertical bank above the heads of the watching men. They saw the water still streaming from the bottoms of his upturned ivory white floats. He waved an arm and was gone—westwards—across the Peninsula towards Macau, while they watched him until the sound of his engine died away and

the tiny speck was lost to view in the grey-purple distance. The crowd of gaping coolies dwindled; the fishermen in the sampan resumed their occupation; the old Chinese crane driver continued his conversation with a Sikh policeman, and the airmen on the sea wall walked slowly back to the hangars in silence. After seeing that piece of vibrant life wheeling above them, the earth seemed somehow dull and colourless. One of them pushed his topi back on his forehead and mopped his brow. "Strewth," he said, "bit 'ot to-day." He ruminated further with himself: "Wouldn't mind a flip meself now," he added, contemptatively, in unconscious tribute to the witchery of the seaplane.

II.

They saw the wreck of the s.s. *Kassam*, perched high and dry upon the rocks of the Capsuimun Pass by the mountainous seas of a typhoon a day or two previously. She looked rather like a toy steamer left in the bath by a small boy after the water has run out. A couple of Indian watchmen emerged from the deckhouse as Peter circled round the ship and stood on the slanting deck in the hot sunlight, their long striped shirts, worn outside their trousers, flapping scarecrow-wise in the easterly breeze. They waved mechanically as he turned away.

Arriving over Cheung Chau Island, Peter crinkled his eyes in the bright light in an endeavour to pick up the Portuguese machine which had arranged to meet the British seaplane at that rendezvous. He climbed in widening circles to 5,000 feet. The visibility was literally marvellous. Away to the east spread the Pacific—thousands of miles of it—gleaming in the sun. No definite horizon could be seen, but the sea seemed to lift upwards as it merged into the sky and the two together appeared to form the interior of a beautiful transparent bowl of an infinite blue-tinted brightness. North-east and South-west stretched the China coast, a long line of great bays, sweeping one after another into the blue infinitude of distance; bays filled with romance for Peter, even the names spelled intrigue to him, Bias Bay, Hong Hai Bay, Mirs Bay, Hie Chi Chin Bay, running up to Swatow and Swbaue, names filled with stories of piracy and adventure. Southward lay the great Gulf of Hanoi, sweeping a thousand miles down to Indo China. Inland, over the island mass of Lan Tau, he could trace the winding silver of the Canton River, river of fragrant streams, with its side tributaries running off to Kongmoon and Wongmoon. Eighty miles away could be seen the town of Canton, beyond which reared range after range of rolling hills disappearing into the purple dimness of Asia.

Hooch patted him on the shoulder and pointed westward, where a

silver speck was climbing up above Lan Tau to meet him. It was Commander Cabrale, of the Portuguese Naval Air Service, coming to escort them across the mouth of the West River to the Portuguese Colony of Macau.

The two machines joined formation over the western end of Lan Tau Island at about 2,000 feet, and proceeded in company. Peter waved a hand as he came within twenty yards or so of the Portuguese machine, and the answer was a wild gesticulation from the passenger and a gleam of white teeth in the smile of recognition from the pilot. Together they flew across the mouth of the West River, and saw the long crescent curve of demarcation separating the blue green of the Pacific from the dull amber brown of the river water, coloured with alluvial mud. Half-way across, a white-painted steamer belched a column of black smoke into the clear morning air; the Hong-Hong boat returning from Macau; here and there a fully-rigged junk, with great shell-shaped sails, tacked her leisurely way against the light north-easterly wind. Their crews rushed to look up at the two seaplanes passing over, and fired an occasional string of crackers to dispel the evil charm of such original devils.

Presently they struck the great curving coast-line again, and with it the colony of Macau.

Hidden away in a bay surrounded by high green hills, with its sweeping bund or praya and long streets of pink, white, yellow and blue houses, Macau seems essentially Mediterranean in atmosphere, and viewed thus from the air, the thousands of Oriental junks and sampans which cluster thickly in the harbour appear almost grotesquely at variance with so Riviera-like a setting.

As they approached the colony the two machines gradually lost height, and on arrival over the bay Peter broke away from the other machine, and, flying low along the bund, dipped in a salute to the Portuguese flag on the roof of the big white Palacio de Governo. A cluster of officials, including His Excellency the Governor and his wife and family, waved from the terrace as the seaplane swept past. Then he climbed again, and, joining Cabrale, circled once above the town and proceeded to the seaplane station on the Island of Tai Pa, where the two machines landed in a silver smother of foam and taxied slowly into the beach.

As his seaplane's ivory white floats grounded gently upon the yellow sand, Peter switched off his engine and pushed his goggles back on his forehead. A crowd of naked Chinese coolies, up to their breasts in water, were drawing the machine farther up on the shelving beach. The Portuguese seaplane, similarly beached, was unloading Cabrale and his passenger.

As the C.O., Hooch and Peter walked down the plank on to the firm

sand they were greeted by a crowd of officers in resplendent white uniform. First to meet them was Cabrale himself, who ran along the sand, still in helmet and goggles—a dapper white figure with a coloured splash of medal ribbons on his breast. He thrust himself through the group and shook all three warmly by the hand, bidding them welcome in English, with but a slight accent. His passenger, another officer, was telling the others, in excitable Portuguese, of the meeting of the two machines. He turned with smiling gesticulation to Peter:

“ I think you come too close for fun, eh ? ” he said, and made a fisherman’s story illustration with his two hands, then burst into volcanic laughter, when his eyes seemed to disappear from view in his fat cheeks.

Cabrale introduced him as Commandante Arbreyo, the Chief of the Police. Introductions then followed generally all round, each with punctilious salute, accompanying a click of the heels and a bow, followed by a prolonged handshake. There was a Zannatti, the A.D.C. to the Governor of Macau, a tiny man in naval uniform, speaking very precise English in a prim and proper way, and who was a perfect foil to the immense and volcanic Arbreyo; there was Lico, the Captain of Artillery, with long romantic sidewhiskers running down his jawbone and a wonderful military hat that was almost too good to be true; there was Pinhero, the harbour master, and Carmona, the Captain of the gun-boat “ Patria,” which represented the Portuguese Navy in South China. There were several other officers and one or two civilians, whose names, uniforms, foreign gestures and long black sidewhiskers a l’Argentine filled Peter with memories of musical comedies and novels of the “ Prisoner of Zenda ” type. It really was extraordinary finding that people like this really existed.

Watching at a respectful distance from the group of officers in the background were a number of black soldiers standing incongruously large and gawky against a crowd of Chinese coolies. They were recruits from Portugal’s African Colony in Mozambique. Of immense physique, they yet seemed like great children with their bare legs and feet appearing from beneath short trousers that just covered their knees. As the group of officers moved up the beach, the negroes broke into great smiles, showing big white teeth gleaming in chocolate-coloured faces. They saluted sheepishly, like shy children set to show off before grown-ups.

So they arrived at Cabrale’s with a broad shady veranda overlooking the bay. Madame Cabrale, looking very blue-eyed and English, as, indeed, she was, received the visitors with open arms, and introduced them with further due ceremony to the ladies of Tai Pa. Peter’s back began to ache from so much bowing, the strain of politeness was also begining to tell on Hooch, when round the corner of the veranda

came three who greeted them both with entire lack of ceremony; these were Pedro and Julietta, aged approximately eight years each, and a large black dog, answering to the name of Pica. All three were talking at once, and were anxious to renew an acquaintance started some months ago on the sands of Repulse Bay in Hong-Kong.

Peter and Hooch produced a mysterious parcel, which, when opened, disclosed a rubber bathing horse of almost unbelievably stupid facial expression. They blew it up amidst the cries of amazement from the Portuguese ladies and the incredulous raised eyebrow glances of the men. Pedro and Julietta thought it was great fun, and only Pica eyed this strange monster with an occasional low growl of mistrust.

Followed Tiffin, in which Peter found himself seated between two Portuguese ladies, whom he discovered, to his horror, incapable of speaking English. He was just bracing himself for an embarrassingly silent meal when Hooch addressed him from the other side of the table:

"I say," said Hooch, "what's the French for 'Rather a fizzer'?" He indicated a young Portuguese señorita seated on his right with dark hair, dancing brown eyes and an adorable smile.

"I don't know," answered Peter, "but if I *did* know I'd tell her myself."

He then proceeded to address his own companions in excruciating French, which seemed to cause a certain amount of amusement. (May heaven forgive the originator of the methods of teaching French in English schools.) He also tried conversing with them in Spanish. Having taken Spanish as an extra language when passing the entrance examination into Cranwell, he thought he knew something about it, but he discovered that the sentences one translated from a grammar book bore no sort of resemblance to the kind of thing one wanted to say to a gay señorita at a talkative tiffin party. His accent, too, was apparently almost side-splitting in its inefficiency. However, all went well, and the good wine of Portugal flowed merrily, as Peter thought, a jolly sight too merrily for the time of day. But when a charming señorita is passing the port, how can one refuse?

Finally, tiffin was over, and Cabrale announced that, if the visitors were of a mind to see it, there was an amusing spectacle about to take place on the shady side of his house. The visitors intimated that they would be honoured, whereupon the entire company proceeded to a number of cane armchairs arranged *à la théâtre* upon the short, rough grass in the shade of the white walls of the bungalow. Little Pedro, who had attached himself to Peter, announced in a stage whisper that it was a *surprise*, and was instantly repressed in shrill Spanish by Julietta for nearly giving the show away. Somewhat mystified they took their seats with the rest of the company and awaited events.

Before them rose a rocky hillside, the coarse grass burnt almost brown by the hot sun, and seated in tiers like so many squatting yellow idols were hundreds of Chinese, some smoking evil-smelling cigarettes, some chewing nuts and spitting, all talking and chattering in an undertone of suppressed anticipation. To the right the sun gleamed brightly upon a sparkling sea. Immediately in front of them the coarse grass had been worn away into a sort of rough stage or roadway. This was apparently to be the scene of the entertainment.

III.

Pedro had said it would be a surprise. He was quite right. It was!

From the rear of the house, out of sight from the spectators, a single voice, strong and stentorian, suddenly raised an intoned interrogative in some strange tongue. It was answered by a deep-chested chorus of many male voices, full throated and powerful, followed by the stamp of heavy feet. Again the single voice intoned, again it was answered by the deep-noted chant. There was something magnificent about those voices, something almost frightening in their bass vibrance. In the silence that followed there leapt into view a figure that reminded Peter of Umslopogaas in "King Solomon's Mines." He was dressed in the full panoply of a fighting Zulu. A head-dress of nodding ostrich plumes, a leopard skin round his loins, metal bracelets upon his arms and feathery garters round his calves. In one hand he clutched a large fighting spear, and in the other an eye-shaped shield of raw-hide leather and a number of smaller assegais. His chocolate-coloured body was naked, save for the ornaments, and his skin gleamed in the sun like a Japanese wrestler's, as though it had been greased with oil. He was a magnificent specimen of manhood, standing fully seven feet high, and for a moment he posed in the centre of the amphitheatre, his broad, bare feet wide apart and his arms outflung. Then he raised his right foot and brought it down with a heavy stamp upon the ground, at the same time lifting his voice in a drum-like call.

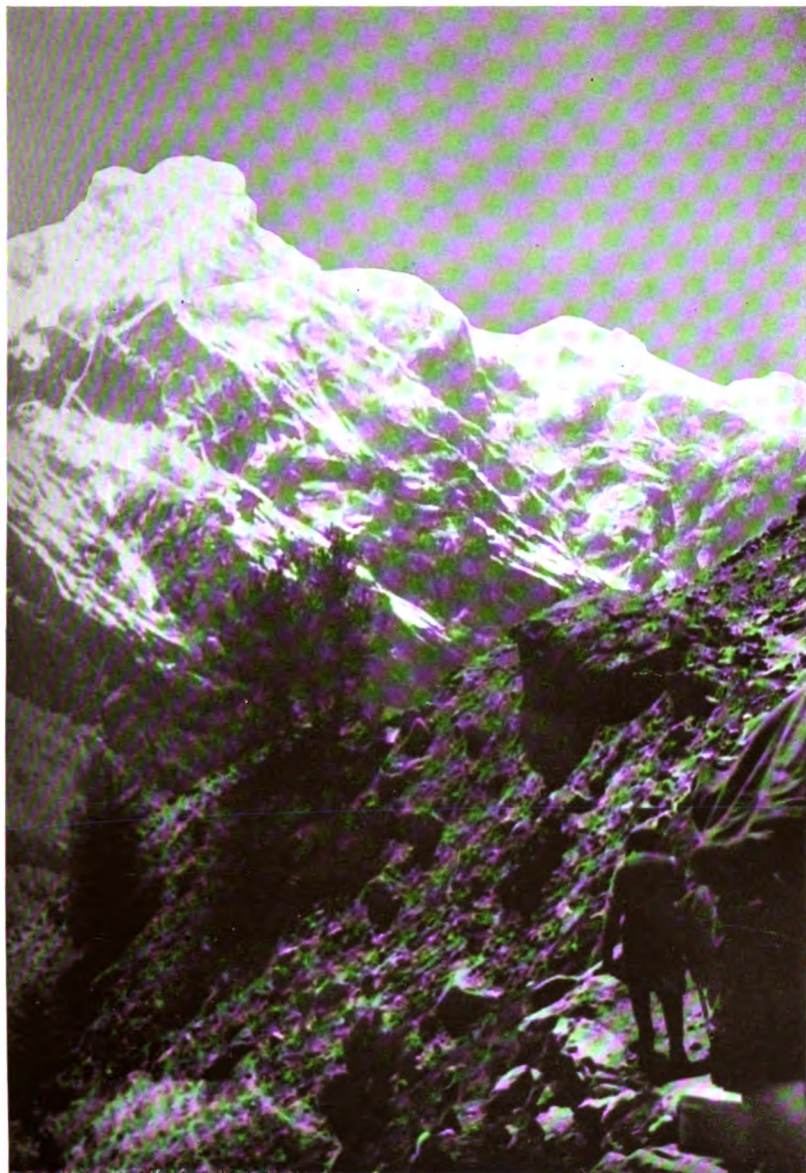
Round the corner came a hundred and fifty more, dressed like him, sighing a deep-toned chant and from time to time stamping their feet in unison. The rhythm of the song was perfect, and the time became faster and faster until it reached a wild dance cadence with the blacks leaping in the air to its frequency, and still keeping the beats by the stamping of their feet. In the background, too, now could be seen more natives playing upon tom-toms, whose constant vibration added to the din. To be journalistic, it was a most impressive spectacle.

Beside Peter, Zannatti was explaining in his high-pitched English

that these were the soldiers of a native regiment recruited from Mozambique, and who served two years as garrison of Macau. Before they returned home to Africa they gave a war-dance in their native dress in farewell honour of their white officers. Peter only listened to this with half an ear, for he was fascinated by the frenzy with which some of the men were dancing. Sweat gleamed upon their bodies, it was mid-afternoon in August, and the temperature in the sun must have been close upon two hundred, yet the men danced as though unaffected by the heat. Sometimes they used Portuguese phrases and words, for Peter noticed several sibilant sounds which he at first thought were imitations of a snake, but which gradually impressed upon his ear as "Si Señor, Si Señor"—*stamp, stamp*—"Si Señor." Every now and then an individual would leap out from among the dancing ranks and writhe his naked body alone, capering and posturing in front of his fellows—a picture of primæval savagery.

The primitive dance, with its wild fanaticism, stirred some responsive chord of excitement in the blood of those watching. Even the ladies were leaning forward in their chairs following the movements with rapt attention. It was a unique experience, and though to the educated mind there was nothing to it but a number of half-naked negroes shaking spears and shouting unintelligible songs to a simple rhythm, it was easy to see how such natives could dance themselves into an absolute frenzy of fighting madness when physical fatigue was quite forgotten and all emotions were submerged in the instinct to kill. Peter always remembered the rhythm of those gleaming, writhing bodies and the heavy stamp of the bare feet, and for a long time afterwards the name Macau for him conjured up a vision of these Mozambique soldiery dancing beneath a hot sun against a background of spell-bound Chinese spectators.

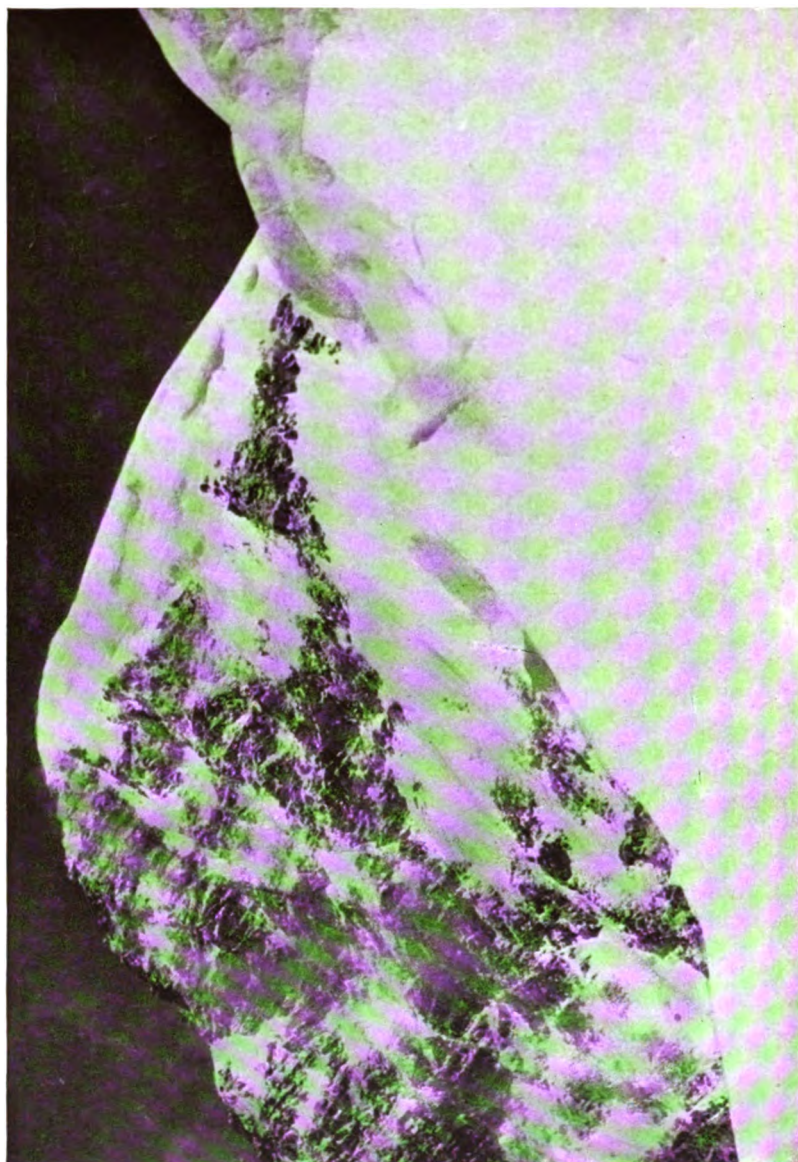
At the conclusion of the entertainment Peter left to superintend the housing of his seaplane in the mat-shed hangar built at the head of a small slipway. In this he was assisted by a motley crew of Chinese coolies, Mozambique soldiery and Portuguese mechanics. As Peter could not speak any of the three languages thus involved, charge of operations was taken by a petty officer in the Portuguese Navy, who was standing by with a motor-boat from the gunboat *Patria*. Eventually the machine was satisfactorily stowed without so much as a scratch upon her precious paint-work. Peter then smoked a cigarette with the petty officer, to whom a Gold Flake seemed rather a waste of time since he preferred a particularly black and evil-smelling pipe, into the bowl of which he thrust two cigarettes, complete with paper, and lit and smoked them with apparent enjoyment. He showed Peter with evident pride over his motor-boat. She certainly was a beauty, with two six-cylinder petrol engines driving high-speed propellers, and was,



[Copyright Photo.]

THE CONQUEST OF MT. KAMET.

The approach to Liti—the last village—through magnificent Alpine gorges.



[Copyright Photo.

THE CONQUEST OF MT. KAMET.

The final slopes of Mount Kamet (25,447 ft.), taken from 22,500 ft. On the skyline is the snow and ice ridge by which the summit was eventually reached.

said the petty officer, stroking her mahogany wheel with a caressing horny hand, "the fastest thing this side of the Pacific."

"Except," said Peter, pointing towards the hangar wherein rested the seaplane, and they both laughed with a mutual understanding for the other's pride in his craft.

Presently to the motor-boat came Cabrale and one or two officers, including the A.D.C. and the C.O. and Hooch. All embarked, and a course was set for Macau. As they rounded the corner of the bay, to disappear out of sight from Tai Pa, there could be seen, waving from the veranda of Cabrale's house, two small figures: Julietta was holding aloft a large rubber horse out of the reach of a big black dog which jumped upwards, barking. As the trio was lost to view, the petty officer opened the throttles of his engines with a smile in Peter's direction; a wave of his horny hand comprehensively embraced the leaping fountain of foaming water rushing beneath the stern, the rapidly dwindling Island of Tai Pa and the harbour of Macau looming up ahead. His dark, swarthy face seemed almost emotional as he noted Peter's grin of approval, and when they arrived at the long wooden pier beneath the Governor's Palace at Macau he came alongside the landing steps with the delicacy of an expert chauffeur parking an expensive Rolls-Royce. "V'la," he said, as one who achieves merited success, and cleared the ensign at the stern with a flick of his forefinger.

IV.

Taking rickshaws, they made their way towards the Riviera Hotel. The darkening streets were crowded with Chinese coolies in various stages of undress, with beggars exhibiting horrible sores, with dirty little children shrieking and playing in the gutters and old crones burning joss-sticks in the doorways. From the lighted upper windows of the dark overhanging houses leant black-haired Chinese girls in gaudy short jackets and trousers, smoking cigarettes and striving with their bright eyes and shrill laughter to catch a lover from among the scurrying crowd. Behind them sounded the interminable music of some Chinese song played dirge-like and monotonous upon pipe instruments or one-stringed fiddles. Intermingled with the noise came the "click-clack" of the Mah Chuk players in the gambling rooms. Here and there a Portuguese soldier from the town's artillery strode his lordly Western way through the yielding mob. Standing at one street corner were two black soldiers from Portugal's African Colony. Each was sucking with child-like appreciation a yellow mango bought from a filthy itinerant vendor. The latter stood beside them, dwarfed by their Herculean build.

Arrived at the Riviera Hotel they changed into mess kit, and were entertained by the officers (air, military and naval) of the colony at dinner. This was a great success. There were no ladies present, and a number of speeches were made in strange foreign tongues to the accompaniment of loud cries of "Viva" and "Eep, eep, oorah." Peter himself was urged upon his feet, and made a surprisingly fluent discourse in the French tongue. A slightly strained atmosphere was introduced by Hooch, who, rising to reply to the health of His Majesty King George of England proposed the health of His Majesty the King of Portugal, whose name, he regretted to announce, he had completely forgotten. He was apparently equally unaware of the fact that Portugal had been a Republic for a considerable time, and that Royalists were not particularly popular. However, this was quickly explained to him, and the stir blew over under the tempestuous laughter of Arbreyo, to whom the C.O. had just recounted *une petite histoire*.

There is a very potent liqueur which the Portuguese serve with the coffee called "aguardiente." The translation is literally fire water, and a more appropriate name was never invented. It is, on the whole, a most deceptive beverage, for while apparently having no effect upon the countrymen of its birthplace it is apt to do strange things with the unenlightened foreigner.

So the party proceeded, somewhat flushed with the good wine of Portugal, to a dance to be held in honour of the visitors at the Gremir Militar or Military Club. Here they were presented to His Excellency the Governor of Macau and his lady. The former expressed (from the interior of a large black beard) his intense appreciation of the reunion between two of the oldest alliances in the world. They agreed with him and flung themselves into the dance with zest.

It was a hot night, and they danced out of doors in the coolness of the gardens. A full moon, white, round and romantic, shone down through the branches of the trees and lit up the China Sea in the bay below with silver magic. There were scents of jasmine and mimosa blossom heavy on the night air, and hundreds of little paper lanterns hung about indiscriminately added their gentle coloured light to the spell. Here and there in the background, armed with iced drinks, moved Chinese "boys," white-coated and soft-footed, their faces aloofly expressionless. Seated in groups on the veranda overlooking the scene were the elderly señoras, mothers and chaperones of the young señoritas, so demure when with mamma, but so sparkingly different under the moon. It was not done, Peter discovered, to ask a girl direct for a dance, one must be presented to mamma for approval first by some other cavalier, and stand beneath a battery of elderly eyes while the object of one's attention gazes at one provokingly over the top of her fan.

A band, with guitars and violins, crooned softly in one corner of the garden, and the swaying couples in resplendent mess uniforms and beautiful evening frocks seemed part of a fairyland of make-believe.

How many pretty Portuguese damsels Peter fell in love with that night is a question he often asked himself afterwards, but his mind was filled the next morning with a myriad pictures of dark hair, flashing eyes and laughing lips, of strange and attractive names like Celesté and Therese and Louisa, and of haunting tango tunes running pleasantly through his brain.

The dance finished about three in the morning, when Peter accompanied Captain Lico in a motor car to the house of the latter's fiancée. There occurred a scene which Peter had always thought only to exist in the imagination of mediæval writers.

Standing beneath the balconied window of his lady, who, Peter discovered, rejoiced in the name of Angelique, Lico serenaded his beloved. He had a pleasing tenor voice, and he strummed musically upon the strings of a beribboned instrument like a mandoline. A romantic-looking young man, with big soulful eyes and black side whiskers, he wore a high musical comedy military hat upon his head and big epaulettes upon the shoulders of his mess jacket. He had discarded his sword for dancing, and a long silken tassel hung from the broad cummerbund at his side. As he sang he gazed up into the face of the big white moon that bathed the side of the house in silver light and cast deep shadows beneath the trees on the lawn. His songs were in Portuguese, and thus Peter understood no word of them, but that they were love songs he did not doubt, and it was no wonder that he dropped off to sleep in the car at the sheer romance of it all.

Also, he was rather sleepy.

That was the climax of the visit for Peter.

The next day they were entertained at an official banquet by the Governor, and were conducted on a motor tour through the colony, where they observed many things both weird and wonderful from the tomb of Camoens, the great poet, to the new Casino, where Hooch lost a lot of money at fantan. In the evening they were left to the tender mercies of certain of their own countrymen who were resident in Macau, including a number of police cadets, learning Chinese, and two naval officers from a British armed launch which was engaged in patrolling the narrow island waters running up to Sheki, some miles north-west of Macau. By these they were entertained in ways strenuous and peculiar to the mad English.

Altogether they agreed on returning to Hong-Kong the following morning; a thoroughly cheery week-end.

AUTO-SUGGESTION

IN days gone by the sailor was a simple sort of chap
A horny-handed tarrybreek, who liked his game of nap
And ran a Crown and Anchor board if Jaunty wasn't nigh
(Or if the Jaunty had been tipped to close his weather eye !):
He'd little education and could scarcely read or write,
His only disyllabic words were ones I cannot cite:
His leery eye would glisten at the magic word of "Rum,"
With which he loved to fill himself and make the seaport hum
Until his pay was finished or was pinched by some fair jade:
His mess knew neither Tickler's jam nor Keiller's marmalade,
Which he'd have dubbed effeminate if he had known the term,
And a shipboard soda-fountain would have either made him squirm
With acrimonious rage or else evoked the words that sear
From one to whom "canteen" conveyed no lesser thought than beer.

That simple-minded sailorman has vanished long ago,
And now there's very little his successors do not know:
They ken the works of both the Steins, discussing them with pep,
The relativity of Ein, the statuary of Ep:
They study all the "isms" and the "ologies" as well,
While Coué finds disciples, as this little tale will tell:—

H.M.S. *Ineffable* arrived and dropped her hook;
The Captain summoned Number One, the Carpenter and Cook:
"I wish to give a dance on board to brighten up the lives
Of all these folk in Aden—in particular the wives;
Now see to it that none has cause for moaning at the bar,
For well we know what residents in tropic climates are."

The snowy deck was holystoned until it fairly shone,
The gleaming brass was burnished till it made the sun look wan:
The bandsmen practised daily with a most unholy din,
The belching of the big bassoon, the wail of violin;
The derricks laboured overtime, a-hoisting out the gear,
The crates of various whiskies and the hogsheads full of beer,
With sandwiches and lemonade and millions of gateaux,
While coloured bunting everywhere was hung, aloft, alow,
Discreetly veiling places where non-dancing couples stay
("the 'ugging 'utch for officers," as ribald sailors say !).

The evening came; all Aden came, rejoicing in the fun,
 And while they danced upon the deck around the after gun,
 I noted with embarrassment the place for sitting out
 Was mostly decorated with (intentionally, no doubt)
 The square-shaped flags of crimson with St. George's cross in white
 Which hid the sitting couples most effectively from sight,
 For well I knew the meaning of that flag discreetly hung:
 'Twas naval for "affirmative" (or "yes" in mother tongue).

In honest admiration I was forced to raise my hat:
 Could Coué crave a compliment more delicate than that?

R. R.

HE DID HIS BEST

Contented minds in vast majority
 Accept, with tongue in cheek, a banal note
 The work of those who in authority
 Arbitrate on scheming purposes remote,
 And say
 "You have well done young man
 To-day:
 As well no doubt you can."

Such meritorious words an unjust fate
 Acclaims as his who dares so strong abuse,
 A tribute he will entertain to hate,
 For pride of finer deeds in others' shoes.
 And yet,
 Though you might wish as much,
 Forget!
 And leave the like to such.

'Tis easier thus to recreate your mind
 In carefree thought of whom you'd emulate;
 Accept in scorn from those who would be kind,
 While you in agony expostulate
 You are
 Whose praise by such reward,
 So far
 Cuts like a bloody sword.

H. W.

JUNGLE SHOOTING FOR AIR FORCE OFFICERS

GROUP-CAPTAIN L. A. PATTINSON, D.S.O., M.C., D.F.C.

THE British officer's dream of India, as a country offering prospects of novel and magnificent forms of sport easily obtained and within the compass of the average subaltern's slender means, has faded into tradition. Nevertheless, pig-sticking, big-game shooting and some forms of small game shooting, that are unobtainable in Great Britain, still flourish in various parts of India.

That most Air Force officers complete their tour of service without sticking a pig, shooting a single head of big game, or having one good day's sand-grouse, duck or snipe shooting, is easily explained by reference to the location of our stations, and by making a few measurements on a suitable map.

As an illustration of comparative distances between places in India and in Great Britain, it is worthy of note that the air route from the Aircraft Park, Lahore, to No. 3 (Indian) Wing, Quetta, via Peshawar or Kohat is approximately 700 miles, the same as from Land's End to John O'Groats via Bristol.

From Quetta to the middle of Sind for duck shooting is 300 miles. From Peshawar to hill-shooting ground in Kashmir by rail, road and track is more than 250, or by rail to the North of the Central Provinces for tiger shooting is 1,000 miles.

The expense of keeping horses and sending them some hundreds of miles to a suitable centre rules out the magnificent sport of pig-sticking for most Air Force officers. It may similarly be argued in regard to big-game shooting that the time and expense involved in reaching the shooting area, combined with the difficulty of making arrangements for an unfamiliar sport in a strange country, as inaccessible from the North-West Frontier as is Poland from London, are not justified by the remote possibility of shooting a tiger or the pursuit of wild goats, sheep or bears in their native mountains.

It is, however, certain that those who have taken the trouble to overcome the initial difficulties, and have once experienced the fascination of hill or jungle shooting, do not hold this opinion.

Cantonment life in India tends to become monotonous, and the stereotyped summer leave at a hill station, though it gives a much-needed climatic tonic and change of scene, does not normally involve any radical separation from the society or occupations of the plains.

The ideal holiday from the typical Indian station, with its routine duty, club and mess life and games marred by the heat and glare, calls for solitude, fresh surroundings and some simple but absorbing pursuit. A shooting expedition gives all these, combined with beautiful and interesting scenery and, if big game be the objective, the prospect of such thrilling moments as are rarely matched in a sportsman's lifetime.

Big game possibilities in India may be roughly divided into jungle shooting and hill shooting.

Of these the latter has obvious advantages, since it provides a retreat from the heat of the plains during the summer leave season. Although the journey to the shooting ground usually absorbs more time than that to tiger country, it includes some days of marching—which are in themselves pleasant and interesting—and good preparation for the serious business that is to follow.

In spite of its corresponding disadvantages, jungle shooting will probably appeal more strongly to a prospective big-game enthusiast, as offering the chance of meeting dangerous game at close range; and because from the North-West Frontier it is possible to commence operations in a jungle block within a shorter time than is needed for reaching the homes of the red bear and the great goats and sheep of the Himalayas.

To conjure up a vision of a successful tiger shoot without emphasizing some of the difficulties of its realization would be dishonest. It is necessary to emphasize the fact that success depends on the use of information that must be acquired by individual enterprise, and that no complete set of hints and tips exists or is likely to be produced. Nevertheless it is hoped that the following notes may be useful as a guide to study, and in a few instances may be of direct practical value.

The first and most obvious questions are those of time and expense. Tiger hunting is in the nature of a campaign in which knowledge of a considerable area of difficult ground, waiting to get into touch with the quarry, and, thereafter, some days at least in which to organize an actual meeting, are required.

The method is to tie out baits in various specially selected positions of the shooting area or "block" in the hope that a tiger will find them in passing, and localize himself in suitable cover by killing and staying near the carcase.

Some information regarding suitable tying-up places, and the general lay-out of the block can be obtained from the local shikari and possibly from the forest officials; but this is not always either comprehensive or accurate, and the sportsman must rely mainly on personal reconnaissance both for selecting the places and for making plans for dealing with a "kill," if he is lucky enough to get one. When it is

considered that tigers do not normally stay in any particular place, but range over large tracks of country, and that a shooting block may extend to ten square miles or more that must be covered on foot, the nature of the time factor will be apparent.

For a reasonable chance of success not less than three weeks should be spent on the ground; adding a week or eight days for travelling, a month's leave, or more, is required.

The question of expense has to be carefully studied in advance, and it may be stated quite definitely that most officers have to cut down their normal expenditure in order to save up for a shoot. There is a tendency in India to waste a deal of money in the normal course of station life, particularly on drinks at the club. If luxuries of that kind—which are no more necessary than they are in England—be cut out in the interests of sport, life should be both more healthy and more enjoyable.

Rates of pay are good, and it should be possible for a flying officer or a flight lieutenant to save enough for shooting. A rough calculation of the expenses of a three week's shoot shared between two, based on actual experience in the Central Provinces, gives living and shooting expenses as Rs.280 per head, and the cost of a return journey to and from Peshawar with one servant as Rs.200. In the round total of Rs.500, a bearer's wages are not included, as they are common to life anywhere in India; on the other hand allowance is made for living and travelling in comfort, and for an efficient tiger-shoot, with the necessary shikaris, coolies, and beaters, and with calves for tying up as baits. On the basis of a month's absence on leave the total is not high.

In assessing the expense of a shoot, many officers forget to credit the total with their normal expenditure on leave in the hills, or at their station.

It is suggested that a month's leave for golf or gaiety in Kashmir would be very cheap at under Rs.17 a day, the modest figure for the jungle shoot. If the alternative of foregoing leave be taken into account, Rs.5 a day might fairly be deducted, leaving the total to be found for the shoot at Rs.350.

No mention has been made of the cost of such initial equipment as weapons and cartridges. This is not necessarily so formidable as might be supposed. The cost of the cartridges may be dismissed as negligible, even if the necessity for preliminary practice is taken into account.

Assuming that economy is important, and that the armoury is required to deal with all jungle animals except elephant, one rifle will suffice, supplemented by a shot-gun with ball cartridges for emergency.

The principal weapon must be a thoroughly reliable double-barrelled

rifle with good stopping power, and light enough to be carried all day in hot weather. The modern weapon that answers this description is the double-barrelled high-velocity hammerless rifle of .400 to .475 calibre, but even second-hand this would cost at least £40 in England, with a thirty per cent. import duty for India, or, if bought locally, an equivalent amount of Rs.600 or more. It is therefore necessary to consider older rifles, and it is fortunate that the need can be supplied by purchase of a second-hand hammer express of .577 or .500 calibre. Although the mechanism of these is antiquated and clumsy, there is no doubt about their reliability or stopping power. For all-round short-range work the .500 express is probably the more suitable. It has the advantage of lightness as compared with the .577 or the modern high-velocity rifles. A sound specimen by a first-class maker, and in good condition, can be bought, complete with case and cleaning materials, for £10 in London. Although there is no lack of rifles of all sorts in India, the beginner would be well advised to make his purchase in London, either from a first-class gunsmith, or after inspection by one.

Other equipment that will be required is either part of an officer's ordinary kit, or obtainable locally for a small sum. A good electric torch with a clip for attachment to the rifle barrels is needed for sitting up at night, as is a mattress covered with khaki or dull green. Skinning knives should be made to order in the bazaar for a rupee each, and preservatives form part of the consumable stores that are included in the general expense of the shoot. Particulars of these, with most valuable directions for skinning and curing are contained in a pamphlet, "The Preservation of Shikar Trophies," that Messrs. Van Ingen and Van Ingen, the famous taxidermists of Mysore, kindly issue to prospective customers. A light twelve-foot rope ladder, fitted with wide hooks, is a most useful accessory that can be made by a carpenter-rigger as a spare-time job.

Loans for the equipment or general cost of a shoot are obtainable from a fund administered by H.Q., R.A.F., India, on application through a commanding officer.

Although considerable thought is necessary in connection with equipment and economy, the real difficulty of arranging a jungle shoot lies in the preliminaries of getting to a suitable block at the right time of the year. To appreciate the problem a beginner should read as many of the excellent books that have been written on the subject as he can find in local libraries, or otherwise obtain. Three, at least, that should be studied are: "Indian Shikar Notes," by J. W. Best (now, unfortunately, out of print); "Tiger and Other Game," by A. E. Stewart; and "Wild Animals of Central India," by A. A. Dunbar Brander.

From these will be obtained an accurate picture of a well-arranged

expedition, and much valuable advice on shooting, equipment, and the making of local arrangements. It is, however, necessary to emphasize that direct information about individual blocks, or even particular areas is necessarily lacking. Any advice of this nature would soon be out of date and would, moreover, be injudicious as tending to create undue demand for shooting in the named localities. The reader is, therefore, left with the difficult problem of fending for himself, and will soon discover that this consists, paradoxically, of enlisting the goodwill and help of people who know the country and have already gained the experience that is necessary to success.

There is no country in which politeness and keenness go farther than they do in India, where the giving and receiving of favours and hospitality make one of the most pleasant features of life for those who serve there. In almost any cantonment someone can be found who either possesses useful knowledge of shooting localities, or who can at least put an inquirer in touch with a friend who would be pleased to help. The learner must approach the source of knowledge in a spirit of humility, and express due gratitude for any favours bestowed; beyond this he can make no return for information which is given by a sportsman to a fellow-sportsman who appears likely to make good use of it.

There are a few broad principles that should be borne in mind in selecting a district or an individual block for jungle shooting. The most glowing account, though it may be interesting for other reasons, is of little practical value for this purpose if it relates to a block which is either unobtainable or unworkable by an impecunious officer. Places in which the type of jungle necessitates the use of elephants; or for which a licence is available for local residents only; in which sitting up over a kill after dark is forbidden; or in which shikaris, beaters or calves for tying up are either unobtainable by a visitor or prohibitively expensive, should be avoided.

Unless some powerful local influence can be brought to bear, a locality should be sought in which there are no special restrictions, and in which the inhabitants are accustomed to sportsmen and willing to help them. It should be reasonably accessible by rail, or by road if the use of a private car is contemplated, but not so easy of access from a cantonment or town as to be frequently disturbed by local sportsmen.

Finally, it is to be noted that local migrations of game in accordance with the season of the year, the distribution of water or food and other factors, are not uncommon. All information regarding the prospects of sport in any area must therefore be related to a particular month and to the rainfall of the preceding year.

The best period for tiger shooting in the Central Provinces is from March until the beginning of the monsoon rains in June. Tigers are

dependent on water and shade during the hot weather, and are therefore more easily located and likely to be more consistent in their habits when the sun has reached its full force, and the streams and ponds have shrunk to scattered pools. This is the time during which leave should be obtainable from any Air Force station, although the winter months are undoubtedly the most suitable for leaving Quetta for the plains.

Some discomfort must be endured for the sake of a hot-weather shoot, but this is not necessarily severe, particularly if a block is obtained in hilly country where the sportsman can live at an altitude of 2,000 feet or more.

To summarize the conclusions reached in this article :—

Jungle shooting is a fascinating sport and by careful management can be brought well within the means of most officers. It offers a delightful change from the routine of station life, is intensely interesting, and affords novelty and excitement that appeal most strongly to the sportsman.

Success depends on gaining reliable information, and on politeness and tact in enlisting the sympathy and help of experienced sportsmen, local officials, and the jungle people.

The mere sight of a tiger is worth months of preparation and weeks of work on the ground; and the other animals that share the tiger's home—panther, bison, sambur, chital, bear and nilgai—add greatly to the attractions of life in the jungle.

CORRESPONDENCE

To the Editor of "The R.A.F. Quarterly."

SIR,

The Commissioners of Customs and Excise direct me to enclose a copy of a Public Notice regarding the prohibition on mixing certain hydrocarbon oils which is contained in the Finance (No. 2) Act, 1931. The matter is one which may concern your readers and the Commissioners would be glad if you would assist in bringing it to their notice by reproducing it in your next issue.

I am, Sir,
Your obedient servant,

C. E. L. FLETCHER,

The Secretary.

Custom House,
Lower Thames Street,
London, E.C.3.

6th October, 1931.

FINANCE (NO. 2) ACT, 1931.

PROHIBITION OF MIXING HYDROCARBON OILS.

NOTICE BY H.M. COMMISSIONERS OF CUSTOMS AND EXCISE.

Under the provisions of Section 4 of the Finance (No. 2) Act, 1931, it is illegal for any person to mix hydrocarbon oils in respect of which a rebate of duty has been allowed under Section 2 (3) of the Finance Act, 1928, as amended, with any light hydrocarbon oils, unless he has been granted a licence by the Commissioners of Customs and Excise, and has before the mixing paid to the proper Collector the amount of duty which would have been paid on the oil if the rebate had not been allowed. The conditions attached to a licence to mix are shown in the Appendix to this Notice.

Any person who mixes hydrocarbon oils of the above descriptions without licence and payment of the duty, or who, if licensed, contravenes the conditions attached to the licence, is liable to Customs penalties.

The effect of the prohibition is to make it illegal to mix any heavy hydrocarbon oil (such as kerosene or kerosene distillate), which has been

delivered for home consumption on rebate, with petrol or other light hydrocarbon oil, unless a licence is first obtained and duty paid on the heavy oil. In the absence of definite knowledge to the contrary it should be assumed that rebate has been allowed on all kerosene or other heavy oils.

Applications for licenses may be made at any Office of Customs and Excise.

Custom House, London, E.C.3.

October, 1931.

Notice No. 193.

APPENDIX.

CONDITIONS ATTACHED TO LICENCE TO MIX.

(1) Before mixing any oils upon which rebate has been allowed with light oils the holder of this licence shall pay the duty which would have been paid if the rebate had not been allowed.

(2) The duty is to be paid to the local Collector of Customs and Excise, and the Collector's Warrant is to be delivered to the Officer of Customs and Excise in whose Station the licensed premises are situated.

(3) Twenty-four hours' notice of any intended mixing shall be given to the Officer. This notice shall set out :—

(a) The date and hour at which the mixing is to take place.

(b) The number of gallons and the specific gravity of each description of oil which it is intended to mix.

(4) The licence holder shall retain all books, accounts, records, orders, invoices and documents relating to the receipt, mixing or delivery of hydrocarbon oils at or from the licensed premises for a period of twelve months and shall on demand produce the same to any officer of Customs and Excise.

(5) The licence holder shall keep at the licensed premises tables of the measurements or capacity of each of the tanks and vessels used in mixing and storing, together with accurate dipping rods or tapes suitable for taking an account of the oils in the tanks and vessels affected, and on demand at any time shall produce the same for use by the proper Officer.

(6) Any officer of Customs and Excise shall have free access to the licence holder's premises, and shall be allowed to inspect, examine and take samples of any hydrocarbon oils in the licensed premises.

(7) If required by the Commissioners, the licensee shall provide and maintain to their satisfaction, free of expense to the Crown, suitable accommodation for the Officer.

To the Editor of "The R.A.F. Quarterly."

DEAR SIR,

I hope it will interest you to learn that the Royal Naval Flying Club has now been formed, with Rear-Admiral R. A. P.-E.-E.-Drax, C.B., D.S.O., as Chairman of the Committee.

The main idea of the Club is to provide very widespread flying facilities for Naval Officers. With this end in view Hanworth Park has been chosen as the London Headquarters. All members will have use of the Club and flying facilities not only at Hanworth Park but also all other N.F.S. Clubs, namely Reading, Nottingham, Leeds, Hull, Blackpool and Stoke-on-Trent.

In order to cater for these officers at the home ports, arrangements have been made whereby the same facilities will be available for members at Hamble until the Hampshire Aeroplane Club goes to Portsmouth, when they will have facilities there. At a later date it is hoped to arrange similar facilities at Chatham and Plymouth, while overseas arrangements are under consideration.

Those eligible for election to membership of the Club must be officers who hold or have held permanent commissions in the Royal Navy or Royal Marines, and subordinate officers on the active list.

The annual subscription has been fixed at 30s., with an entrance fee of 10s. until March 1st, 1932. After this date the entrance fee will be increased.

Anyone who is interested in the Club should apply to the Honorary Secretary, R.N.F.C., Hanworth Park, Feltham, Middlesex.

If you are able to give publicity to this matter I shall be extremely grateful.

Yours faithfully,

C. N. COLSON,
Lt.-Comm., Hon Sec.

To the Editor of "The R.A.F. Quarterly."

November 6th, 1931.

SIR,

Discussion may enliven the brightest of Quarterlies, so I will carry on my heavy fighting against the sniping of Wing-Commander Douglas.

Is evasion so economical when it means divergence from the most suitable route and therefore less range or less bombs?

Are long range two-seater bombers carrying a respectable bomb load "axiomatically" almost equal in performance to short-range single-seater interceptors?

Are all heavy aircraft slow, again " axiomatically," and is a machine with 500 lb. of gun and ammunition necessarily heavy?

Is short-range anti-aircraft fire from an aeroplane at an aeroplane relatively stationary " rather inaccurate " ? Has he tried it? Believe me it is more like potting a sitting bird.

Does the fact that it is good to bomb enemy aircraft on their aerodrome make it stupid to bomb them in the air if they get there? Ought we really to let them go home unmolested?

Whether we should have " gun " -carrying bombers or gun-escorts to bombers is perhaps a moot point, but if fitting " guns " to its own fighters makes a bombing formation carry heavy guns instead of bombs—will not something have been gained?

But, after all, I see that Wing-Commander Douglas does agree with me—he wants bigger guns on fighters. If that is granted, we need not quarrel over the type or types which should carry these big guns.

Yours truly,

J. A. CHAMIER.

AIR NOTES

HOME COMMANDS.

NEW SQUADRONS FORMED.

No. 18 (Bomber) Squadron, formed at Upper Heyford on October 20th, 1931.

No. 57 (Bomber) Squadron, formed at Netheravon on October 20th, 1931.

LONG-DISTANCE FLIGHT.

The Fairey long-range monoplane successfully carried out a non-stop flight from England to Egypt during October. The aircraft left Cranwell at 0645 hours on October 27th and landed at Abu Sueir at 1415 hours on the 28th. The total distance to be flown was 2,405 miles.

INSTRUCTION IN INSTRUMENT FLYING.

A special flight has been formed at the Central Flying School for the purpose of giving qualified Service pilots instruction in Instrument Flying. Instrument Flying is also being included in the Flying Instructors' Courses. From January, 1932, it is intended to include in the flying training of all *ab initio* pupils a modified form of the C.F.S. Course.

• OVERSEAS COMMANDS.

EGYPT.

A flight of four Fairey IIIF aircraft of No. 45 (Bomber) Squadron stationed at Helwan, began a cruise to West Africa, the Gold Coast, Sierra Leone and Gambia on October 14th. Proceeding by way of Wadi Halfa and Khartoum, they arrived at Kano on October 27th according to programme. Here news was received of an outbreak of yellow fever in the Gold Coast and French West Africa, which prevented the flight from carrying out their original programme. The cruise beyond Nigeria was therefore abandoned, and the aircraft, after visiting Sokoto and Niamey, returned to Helwan on November 21st. During their restricted cruise the aircraft covered a distance of approximately 7,000 miles.

THE SUDAN.

Three aircraft proceeded to Egypt via Port Sudan and the Red Sea on July 10th, a fourth aircraft accompanying the flight as far as Port Sudan as a reserve. This was the first time that this route had been flown over. The itinerary of the flight was as follows :—

- 10/7/31. Khartoum—Atbara—Port Sudan—Hassa Lagoon (on Red Sea coast, 250 miles north of Port Sudan).
- 11/7/31. Hassa Lagoon—Hurghada—Heliopolis.
- 15/7/31. Heliopolis—Aboukir.
- 17/7/31. Aboukir—Heliopolis.
- 18/7/31. Heliopolis—Assiut—Aswan—Wadi Halfa.
- 19/7/31. Wadi Halfa—Atbara—Khartoum.



THE CONQUEST OF MT. KAMET.

[Copyright Photo.]

The camp at Tapoban (7,000 ft.), three-quarters of the way on our 120 miles march to the Base Camp. In the picture can be seen some of our 60 Dotial porters and one of the Gurkha N.C.O.s. lent by the Army.



THE CONQUEST OF MT. KAMET.

[Copyright Photo.]

Our way led through magnificent forests, gorges and mountains. In this picture can be seen some of the great towers of rock, which on occasions reached the height of 18,000 ft.

The reserve aircraft, while waiting at Port Sudan, took photographs for a photographic mosaic of the proposed natural reservoir for the Port Sudan water supply. This was carried out at the request of the Public Works Department of the Sudan Government.

During the latter part of August three Fairey IIIF floatplanes from No. 47 (Bomber) Squadron carried out a tour of an area in the Upper Nile and Barh-el-Ghazal provinces of the Southern Sudan. The main objects of the flight were to reconnoitre the western Bahr-el-Arab, the Loll and the Pongo rivers from the point of view of their suitability for use by floatplanes, and also to ascertain the suitability of Lakes Ba and Aweil as floatplane bases. The flight left Khartoum on August 26th, proceeding by way of Malakal to Wau (approximately 630 miles south-west of Khartoum), where they arrived the following day. Using Wau as a base, extensive reconnaissances were carried out of the area enclosed by the rivers mentioned above. Much valuable information was obtained regarding the suitability of the flooded area for floatplanes at this season of the year, and of the meteorological conditions prevailing. Information concerning this area has hitherto been very limited, and maps of the district are far from accurate. The flight returned from Wau via Malakal, arriving at Khartoum on September 4th.

CYPRUS.

Owing to serious civil disturbances which broke out in Cyprus on October 22nd, the Governor of the Island sent an urgent request for military reinforcements from Egypt. Seven Victoria troop-carrying aircraft of No. 216 (Bomber) Squadron left immediately for Cyprus, via Ramleh with a company of the 1st King's Regiment, and arrived early the following morning after a journey of approximately 600 miles. The numbers thus conveyed were 126 Army and 23 R.A.F. personnel. This is the first occasion on which troops have been transported overseas by air to the scene of active operations. One flight of Fairey IIIF aircraft of No. 45 (Bomber) Squadron was subsequently dispatched to Cyprus, and assisted in the restoration of the situation by demonstrations over troublesome districts, and by daily reconnaissances covering the whole area of unrest. The Victoria troop-carrying aircraft were utilized to convey troops from one part of the island to another as emergencies arose. A Rangoon flying boat of No. 203 (F.B.) Squadron was sent to Cyprus from Basrah to act as escort to the landplanes while crossing the sea between Cyprus and the mainland.

ADEN.

During September information was received that Zeidi forces had encroached over the Protectorate border and were in occupation of the whole of the Al 'Ain region in Masa'bi territory. An ultimatum was sent to the Imam threatening air action unless his forces were withdrawn within fourteen days. The ultimatum was complied with.

FRANCE.

The most important event in France during the period under review has been the formation of an Air Council. The following extract from the *Journal Officiel* of August 28th, 1931, gives the reasons for the formation of the Council and the translation of the decree establishing its constitution, functions and composition :—

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Extract from "Journal Officiel" de la Republique Francaise, August 28th, 1931.

AIR MINISTRY.

SUPREME AIR COUNCIL.

REPORT TO THE PRESIDENT OF THE REPUBLIC.

PARIS,

August 27th, 1931.

M. LE PRESIDENT,

One of the main functions of the Minister for Air is the equipment of the Air Forces with material which keeps pace with aerodynamic progress. It is essential that the Command, which is actually responsible for the utilization of the material, should be in a position to express its opinion on questions relating thereto. In addition, to satisfy the legitimate requirements of the supreme military and naval commands, closer co-operation between the Ministries for War and Marine, and the Inspector General for Air Defence is required.

In order to facilitate this close co-operation, it has been considered advisable to create a permanent body which shall include the highest aeronautical authorities, the Inspector General for Air Defence and the most competent representatives of the Ministries for War and Marine.

This Supreme Council will be charged with the examination of all questions organization, recruiting, equipment in flying material and armaments, and generally all problems connected with aerial warfare.

I have the honour to submit to you the decree for the establishment of the Supreme Air Council and remain.

JACQUES-LOUIS DUMESNIL.

Minister for Air.

THE PRESIDENT OF THE REPUBLIC.

In pursuance of the decree of October 2nd, 1928, fixing the duties and functions of the Minister for Air.

Acting on the report of the Minister for Air, hereby decrees :—

Article 1.—A Supreme Air Council is constituted at the Air Ministry.

Article 2.—The Supreme Air Council, under the presidency of the Minister for Air, is an advisory body responsible for giving considered opinions on all subjects connected with :—

The general organization of the Air Forces in peace and war.

The participation of the Air Forces in the operations of land and sea forces and in air defences in France.

Procedure for recruiting, general methods of instructing and training the personnel of the Air Forces.

Fighting tactics of the Air Forces.

The drawing up of programmes for material.

Putting into commission of new material in the units and its repercussion on the conditions of utilization.

Industrial mobilization. In addition, the Council may be consulted on all questions which the Minister for Air considers it advisable to submit.

Article 3.—The composition of the Supreme Air Council shall be as follows :

(a) *Members with full voting powers.*

The Minister for Air (President).
The Inspector-General of the Air Forces.
The Chief of the Air Staff.
The Director of Technical Services.
Five General Officers of the Air Forces.

(b) *Advisory Members.*

The Inspector-General of Technical Aviation.
General Officers, Deputy Chiefs of Air Staff.*

The members of the Supreme Air Council shall be appointed by decree at the beginning of each year.

Article 4.—In addition, whenever the Supreme Air Council is required to deal with questions affecting the Ministries of War and Marine and Air Defence, the following shall be convened as members with full voting powers :

The Inspector-General of Air Defences in France.
The Chief of the Army Staff.
The Chief of the Naval Staff and one other member of the Supreme Naval Council.

Article 5.—The Supreme Air Council shall have a permanent Secretariat under the General Staff of the Air Forces under the command of the Chief of the Air Staff.

This Secretariat, which is under the direction of a field officer, is responsible for the preparation of the questions to be considered by the Council, for the resultant reports, and for the safe custody of documents.

Article 6.—The President of the Republic may convene a meeting of the Supreme Air Council. He shall take the chair whenever he considers it advisable ; in such event, the President of the Council of Ministers shall be present at the meeting.

The Ministers for War and the Minister of Marine shall also attend on such occasions.

A record of the deliberations of the Council shall be kept.

Article 7.—In all questions submitted to it, the Council may call upon any civil or military authorities which it considers competent to give advice.

Article 8.—The Council is convened by the Minister for Air as often as is necessary for the consideration of the questions submitted to it.

Article 9.—The Minister shall decide on the action to be taken as a result of the advice and deliberations of the Council.

DONE AT PARIS,
August 27th, 1931.

PAUL DOUMER,
President of the Republic.

JACQUES-LOUIS DUMESNIL,
Minister for Air.

From August 26th to 28th, 1931, air manœuvres were held at Nancy to test the local anti-aircraft defences and to examine certain questions connected with air defence, including the handling of the civilian population. The manœuvres are fully described in the extract from *Les Ailes* of September 3rd, 1931.

* One of these officers shall act as reporter.

Extract from the French Press ("Les Ailes," No. 533, September 3rd, 1931.)

THE AIR MANŒUVRES AT NANCY.

The air exercises last week at Nancy were more concerned with the passive means of defence of a large town against air raids, than with the offensive possibilities of aviation.

The manœuvres at Nancy were simply and solely exercises in the air defence of the territory of the 20th Region, the idea being to test the efficiency of the defensive arrangements for the town of Nancy, the industrial centres of the Meurthe Valley, and Sarrebourg; to prove how quickly all lights could be extinguished and the town warned of an attack; and finally, to see how an industrial centre may be camouflaged by artificial smoke.

The defence comprised various organs of command, two lines of lookout posts, anti-aircraft batteries, searchlights, a section of defence balloons, machine guns for defending aerodromes, and an observation squadron belonging to the 33rd Aviation Regiment.

The attacking forces, under the command of the General commanding the 11th Bombing Brigade, comprised an observation group drawn from the 33rd Regiment, a day bombing group from the 11th Regiment and a night bombing group from the 31st Regiment.

The exercises were divided into two phases. The first, occupying two and a half days, began on August 26th, at 2100 hours. This phase included flight of isolated aeroplanes over the whole defensive area, study of the effect of an alarm on the entraining of a battalion. The second phase, from August 28th at 0700 hours until August 29th at 0020 hours, included firstly the sending up of patrols of aeroplanes, dropping of pamphlets and the camouflaging of the Solvay factories and Pompey steel works; and secondly, from August 21st at 2130 hours, the attack by night bombers, warning the population and employment of anti-aircraft defences and, finally, examining the effect of raids carried out by single aeroplanes.

On the morning of the 27th aeroplanes dropped pamphlets warning the population of the impending danger. Then Maréchal Pétain was present at the camouflaging of steel works at Pompey by artificial smoke. In less than ten minutes after the warning signal, the tall chimneys and the whole surrounding districts were enveloped in a dense smoke. After this the Maréchal went to Liverdun where six defence balloons had been sent up by the Epinal balloon section.

On the evening of the 27th exercises were recommenced and lasted throughout the whole night. The activities of the attacking aeroplanes were redoubled, and the defending guns were kept busy.

On the 28th Maréchal Pétain was present at some artificial smoke experiments which were carried out on the Malzéville plateau. M. Jacques-Louis Dumesnil, Minister for Air, arrived by aeroplane, accompanied by General Poli-Marchetti.

The second phase in the operations, in which the population was to take part, was timed to begin at 0020 hours, all lights being extinguished and all salvage parties, firemen and Red Cross personnel at their posts.

The first alarm was sounded at 2225 hours. The enemy aeroplanes arrived half an hour later and reappeared again at 0315 hours. At 0330 hours the "All Clear" signal was given.

During the day of the 29th, at 0160 hours, all the squadrons from Alsace paraded at Nancy. M. Dumesnil and Maréchal Pétain left Essey for Strasbourg at 0017 hours, from whence they were to return to Paris the following day.

The official conclusion of these manœuvres is that the defence of Nancy and the surrounding districts is adequately ensured. In the opinion of *Les Ailes* it is quite probable that, in reality, things might turn out differently.

GERMANY.

AMALGAMATION OF TWO WELL-KNOWN GERMAN AIRCRAFT FACTORIES.

Reports on the recent absorption of the Albatross Flugzeugwerke G.M.B.H. of Berlin-Johannisthal by the Focke-Wulf Flugzeugbau A.G. of Bremen bring to a successful conclusion the negotiations which have been pending for some time between the firms in question for a definite fusion of interests.

The amalgamation is understood to have the approval of the Reichsverkehrsministerium (Ministry of Communications)—the responsible Government department for German civil aviation—and, in view of the restricted home market of the German aircraft industry, may be regarded as further progress on the road towards reorganization and rationalization.

The Focke-Wulf concern, as a result of the amalgamation, has increased its capital from 200,000 to 285,000 Marks. Control of the Directorate of the new undertaking will be held jointly by Dr. Huth (Albatross) and Generalkonsul Dr. Doselius (Focke-Wulf).

It is stated that, for the present at least, all constructional work of the new concern will be centred in the Focke-Wulf Works at Bremen, but in the event of an improvement in the general economic situation, it is hoped to be able to open up again the Berlin works.

ITALY.

ITALIAN AIR MANŒUVRES, AUGUST, 1931.

Air manœuvres on a large scale took place this year in Italy for the first time. They appear to have been intended mainly to prove the great offensive possibilities of aircraft and the comparative ineffectiveness of defensive measures against air attack, and hence the necessity for Italy to possess a powerful air force.

The air forces taking part were divided into Force "A," the defending force, with 398 aircraft, and Force "B" the attacking or enemy force, with 496 aircraft. The total number of aircraft employed was thus 894, which included, however, various experimental aircraft and a number of light aeroplanes which were used for communication duties, so that the actual total of service aircraft engaged was probably not more than about 700.

The number of fighter aircraft allotted to each side was approximately the same, but "B" had about twice as many bombing aircraft as "A"—220 to 121.

The general idea was that diplomatic relations between two countries, "A" and "B," had become strained, and both countries had mobilized their forces, both land and air, on the north and south sides respectively of an imaginary line crossing Italy from the mouth of the River Frigido, on the west coast near Massa, to the mouth of the River Metauro on the east coast near Fano.

Relations between the two countries became more strained, and war was declared at midnight on August 26th-27th. Immediately on the outbreak of war, "B" dispatched the whole of his bombing aircraft to attack Spezia, and followed up the bombing attack with a machine-gun and low bombing attack by fighter aircraft. Later, in the afternoon of the same day, a further

massed attack by all available aircraft was carried out, which culminated in the laying of smoke clouds to simulate poison gas.

As a result of these attacks the naval base and forts at Spezia were adjudged to have been so severely damaged as to be put out of action for some considerable time, and it was considered that the fighter aircraft and anti-aircraft defences of "A" had proved ineffective in preventing "B's" attacks.

Further similar bombing attacks, followed by low-flying machine-gun and gas attacks, were carried out on subsequent days by "B" on the city and port of Genoa, and on railway stations and military establishments at Bologna and Ferrara. In all cases these attacks were adjudged to have been completely successful in spite of the spirited defence put up by the fighters and anti-aircraft defences of "A."

Several attempts were made by "A" to carry out counter-attacks on important centres of "B," but they achieved comparatively little result, owing to the small number of bomber aircraft which "A" had available, and to the fact that his fighter aircraft were fully occupied in defending the country from "B" and so could not co-operate in the bombing attacks.

Finally "B" decided to endeavour to bring the operations to an end by following up the successful attacks of the three preceding days by launching a large-scale attack on Milan, which was assumed to be the capital city of the enemy nation.

This attack commenced at 3 a.m. with a bombing attack by 80 aircraft, which dropped 50 tons of high explosive and incendiary bombs on all parts of the city. This was followed at daybreak by a low-flying machine-gun and gas attack and, immediately afterwards, by another bombing attack.

Later, at 1600 hours, a final mass attack by all available aircraft, about 400 in all, was carried out, which dropped another 100 tons of bombs and laid further clouds of gas.

As a result of these attacks the city of Milan was considered to have been almost completely destroyed, and the civil population reduced to a state of panic. Consequently, the government of "A," finding in addition that its defence forces were ineffective in preventing these attacks, and that they were almost immobilized owing to the disorganization of the transport services, was compelled to request an armistice.

After the conclusion of the manœuvres the Italian press published many articles which all followed the lines that the manœuvres had provided ample proof of the efficiency of the Italian Air Force, and of the fact that war in the future can only be won by a nation possessing a strong air arm, which is prepared to make the best possible use of it by undertaking an air offensive on similar lines to the methods employed by "B" during the manœuvres.

Most of the articles then proceeded to point the moral that the manœuvres showed how necessary it was for Italy to continue with the building up of a powerful air force, as she did not as yet possess a sufficient number of aircraft to ensure that this policy could be pursued successfully in war. In this connection the following extract from the speech made after the manœuvres by Marshal Badoglio, the Chief of the General Staff of the Forces of Italy, is of interest. "The Italian people must certainly realize the warning which we must draw from these manœuvres; it is necessary to think very seriously in regard to the organization of a powerful air army to defend the country from such a deadly instrument of war. The country must persevere with firmness in her preparations." It is also of interest to note that, during some of the bombing attacks, leaflets were dropped which read: "Italians! In time of war enemy aircraft will not drop coloured paper on your towns and

homes but high explosive and incendiary bombs. Real bullets will be fired and poisonous gas will be used instead of the harmless smoke used in these manœuvres. Italians want peace, but for ages past prudence has taught us that we must not be found unprepared in case of war. An enemy air offensive will be defeated only if we are powerful in the air, and if we have a strong national Air Force."

Extract from the French Press ("Les Ailes," No. 533, September 17th, 1931.)

COMPARISON OF THE FRENCH AND ITALIAN AIR MANŒUVRES.

BY ROGER ALIX.

The recent Italian manœuvres will furnish an excellent lesson if carefully analysed. Italy is friendly to France—at least, the French like to think so and act accordingly. However, it is useless to ignore the perfectly obvious fact that any military weapon fashioned by Italy is for use against France and Yugoslavia. Therefore, it is not a waste of time to study the real significance of her air activity. A few comparisons may therefore be made.

The first comparison to make is in the "spirit" actuating the employment of a modern Air Force by the peoples on either side of the Alps. In this connection the annual manœuvres are always of particular interest.

This year the French air forces, besides the usual work done in the training camps, have carried out extensive manœuvres. It would appear that the French air forces have taken up a course of studies quite above the ordinary methods of intelligence and reasonable investigation.

The first manœuvres, which may be termed "offensive," were those in the Midi. The whole of the general reserve forces, about 200 aeroplanes, were concentrated in the delta of the Rhone. Toulon was heavily bombed by heavy bombers at night and medium bombers by day following the classic methods of 1918. The object was to demonstrate to the Navy that the land air forces can attack the ports and the fleet, and that they constitute a very real danger. The people of Toulon extinguished their lights, and a not very efficient A/A defence force was brought into operation and ran out of ammunition in a few hours. The fleet submitted, without enthusiasm, to this attack by landplanes. In fact, there does not appear to have been any very definite object in these manœuvres. On the third day all units returned to their home stations. If the Navy learnt anything at all from these manœuvres it was that the Air Ministry should be destroyed as quickly as possible, for its activities were becoming both audacious and troublesome. As far as the Navy is concerned the danger lies in the Rue St. Didier itself, not in the air squadrons of Orbetello and La Spezzia.

The second manœuvres, which were purely defensive, were undertaken at the instigation of Maréchal Pétain and carried out at Nancy and Lyons. They represented the first serious attempts at A/A defence of large towns. Grave defects were revealed in those carried out at Nancy. Several days of preparatory work were needed to organize the action against the air raiders. In real warfare, a surprise attack, carried out immediately on mobilization, would thus merely meet with a very feeble resistance. The exercise at Nancy also proved the willingness of the population to co-operate in A/A defence measures and the difficulties that may be expected as regards their protection (shelters, etc.).

Finally, there are the third manœuvres, carried out over the department of the Aisne, which are ending this week. The air forces operated as two forces, as in 1918, and with material closely resembling that used in the

Great War. Experiments on a small scale were carried out in the mobilization of two squadrons composed entirely of reservists, and the transport by aeroplane of a few squads of infantry. Several private aeroplanes, piloted by their owners, were mobilized as liaison aeroplanes. That is all, and it is little enough.

When closely looked into, these manœuvres, considered as a whole, do not bear the mark of a forceful policy. The French Air Force has yet to find its moving spirit and a definite policy. At present it is hesitating. The uncertain conceptions which animate it are reflected in its work. It only studies problems concerned with the safety of the population and the auxiliary service of the other arms, and the vast and serious problems essentially connected with the air service are for the present, to a great extent, left on one side. This kind of aviation policy is hesitating and defensive. There is nothing of this in Italy's air policy.

Les Ailes is far from thinking that the French air forces are inferior to the Italian, either in personnel or in material; it is only the "spirit" which is different, but that is, in reality, the one essential factor. Moreover, the Italian manœuvres were carried out with great pomp, and gave the impression abroad of a well-considered plan. All the leading personages of Italy were present, but the *military attachés of foreign countries were not invited*. The press, which received an abundant supply of communiqués, published long reports. The air manœuvres are the big military event of the year, and the public are supplied with full details of the results. The exercises to be undertaken were explained by Maréchal Badoglio, the highest authority, who also judged the final results. It is worth while to examine this question more closely.

The manœuvres were intended to be, and indeed were, a total mobilization of the whole Italian Air Forces. "It was proposed," stated the Maréchal, "to experiment on the rapid concentration of large masses of the air forces, and their transfer from one theatre of operation to another." This general idea caused a stir in the French political press, but the general press carefully avoided the subject; the French nation in general is deemed unworthy—by those in high places—of being informed as to the aggressive preparations of their neighbours.

The real import of the question was this: There is supposed to be a diplomatic tension between nations "A" and "B" (let us say Italy and France). Italy believes that it will lead to a rupture, and therefore, so as to benefit by a surprise attack, she unexpectedly declares war, and almost immediately after her air forces attack the enemy in full force.

Italy has, therefore, made a careful study of all the problems of organization, re-fuelling and ground organization, raised by the concentration and immediate action of some 900 aeroplanes. Another important point arising from this question was the experimenting in the movement and action of a large number of different air units and therefore experiments with an improved system of liaison between the aeroplanes themselves and between aeroplanes and the ground. Massed attacks, both surprise and low-flying on aerodromes, naval bases, railways and several large towns, such as Milan, were methodically carried out. Finally, a fact of international importance should not be omitted—namely, that Italy officially recognizes that her air forces in the normal course would employ gas which is at present prohibited by all international conventions. One of the communiqués reads thus:—

"Official from Directorate of Manœuvres, dated August 29th, 1931:—At 3 o'clock the "B" naval bombing brigade, leaving its base at Orbetello,

carried out a bombing and gas attack on Genoa. The brigade, approaching from the sea, carried out a surprise attack on the harbour and city, using a large amount of gas, etc. . . ."

And, apparently, the Italian airmen showed extraordinary courage. The nation followed the whole proceedings with great keenness, and in the final communiqué the enemy nation—France—owned herself beaten, and asked for an armistice.

From this the difference in the spirit, already mentioned, which characterizes the French and Italian air forces and gives them such different practical policies, may quite clearly be seen. Those at the head of the French air forces envisage the salvation of the country and victory as the outcome of a glorified ground offensive which, in the present state of French military and air organization, *could only be brought into action during the second month of hostilities*, and the air forces would not be fighting at full strength until the sixth month. Italy, on the contrary, foresees and methodically prepares for an immediate and violent offensive from the air, which would even precede the declaration of war. The High Command has adopted the doctrine of General Douhet, whose extraordinarily forceful personality was described several years ago in *Les Ailes*.

In a series of remarkable articles published last summer, in *Les Ailes*, consisting of a condensed analysis of Douhet's work, Jean Herbillon, in one of his articles on "The War of 19—," writes :—"Rising above the realms of present actual technical facts, Douhet describes the mechanism of forces which will be brought into action in the future so realistically and with such strict exactness to detail, that if a real leader were to arise amongst the air forces of Europe the dreams of to-day would become the realities of to-morrow."

Well, this leader is here in the person of Italo Balbo. With an energy which is rare, and a gift of organization to which France is glad to render homage, this great Minister for Air is achieving new air exploits in Europe which no other power—and, above all, France—can henceforward afford to overlook. Our strategists may discuss these facts . . . All the same, there are the facts. And they point out precise and urgent duties to the French air forces.

UNITED STATES OF AMERICA.

AEROPLANE CONTACTS WITH "LOS ANGELES" AT NIGHT.

On September 29th, 1931, two naval training aircraft were employed in an experiment with the trapeze gear fitted to the U.S.S. *Los Angeles*. The airship was flown at a height of 2,000 feet over Barnegat Bay and a series of contacts was effected by the two aircraft, one of which was "hooked-on" seven times and the other six times. It is understood that this is the first occasion on which this manœuvre has been successfully carried out at night. (*U.S. Army and Navy Register*.)

MARINE CORPS SQUADRONS ON AIRCRAFT CARRIERS.

A new policy with regard to the employment of U.S. Marine Corps personnel and aircraft was made known recently, involving the placing of a Marine Corps observation squadron on each of the two carriers *Lexington* and *Saratoga*. Each squadron will consist of six aircraft, eight officers and about 35 enlisted men. These squadrons are additional to the complement already carried by the carriers. (*U.S. Army and Navy Journal*.)

U.S. ARMY AIR CORPS—ORDERS PLACED FOR MONOPLANE TYPES.

Increasing interest is being shown by the Army Air Corps in monoplane types of aircraft, and orders recently placed include the following types which will be used for "service test" purposes :—

- 13 Curtiss attack aircraft—a two-seater, low wing, monoplane type, with 600 h.p. engine.
- 5 Lockheed fighter aircraft—a two-seater monoplane fighter with 660 h.p. engine.
- 5 Douglas observation aircraft—a two-seater, high wing monoplane type, with 600 h.p. engine.
- 5 Douglas observation aircraft—a two-seater all-metal, monocoque, monoplane type, with two 660 h.p. engines.
- 7 Douglas bombardment aircraft—a low wing, all-metal, monocoque monoplane, with two engines of 660 h.p.

All engines in the above aircraft are Prestone cooled.

It is stated that greater use of retractible undercarriages and wheel fairings will be emphasized in the new aircraft. (*U.S. Army and Navy Register.*)

JAPAN.

NEW CIVIL AERODROME AT TOKYO.

It is reported in the Japanese press that the new civil aerodrome at Haneda, near Tokyo, which covers 131 acres of land and is situated close to Tokyo Bay, has been opened for international traffic. It is stated to be the largest and best equipped civil aerodrome in the Orient. One of its chief features is a 500 metre concrete runway, which divides the entire aerodrome in two from north to south.

Near the half way between the two ends of the runway are the Japanese signs meaning Tokyo which are illuminated at night and serve as a beacon.

Many of the buildings are stated to be proof against earthquakes. In the near future the Tokyo Central Meteorological Observatory will build offices at this aerodrome and will furnish meteorological data as required.

The aerodrome is connected with Tokyo by a paved road, over which the motor journey to the business section of the city can be made in 25 minutes.

TRAINING OF BOY PILOTS FOR THE JAPANESE NAVAL AIR SERVICE.

It is stated in the press that the progress made by approximately 100 boys who entered the Japanese Naval Air Service last year under the new scheme of training boys as pilots has been very good. Under this scheme boys undergo three years' elementary training, six months at sea and a further year's flying training, making four and a half years in all. The method of selection is extremely strict, and the service appears to be popular, as there were stated to be 8,000 applications for just over 100 vacancies.

According to the regulations ordinary seamen can be promoted up to Lieutenant-Commander, though this promotion is rare.

In the case of these boy pilots it is possible for them to attain the rank of captain before they reach fifty-five years of age, provided they are considered suitable.

SOVIET RUSSIA.

It is of considerable interest to note the latest product of the aircraft industry in U.S.S.R. The ANT-14 has recently concluded its initial trial flights in Moscow. This aircraft is a cantilever high wing monoplane of all-

metal construction having a span of 41 metres and a length of 26 metres. It is equipped with five 480 h.p. radial air-cooled engines. The aircraft is designed for long-distance civil passenger traffic ; besides a crew of four, it has accommodation for thirty-four passengers. This aircraft is a product of the T.S.A. G.I. (Central Aero-Hydrodynamical Institute), and the designer is A. N. Tupolev, who has already achieved fame as an aircraft designer in U.S.S.R.

It will be recalled to mind that the Russian aircraft industry of the pre-revolutionary period was quite inadequate for needs of aviation in that country, and that during the revolution and civil wars the industry was destroyed. Consequently the present industry may be said to be only ten years old. The ANT-14 is, therefore, looked upon as a considerable achievement in view of the technical disabilities that the Russians have had to overcome.

The following extract from the Russian newspaper, *Krasnaya Zvezda*, is interesting. It shows how the Russians forecast that the Arctic will be opened up, by air routes and dirigible lines, as a quick means of transit between Europe and the continents farther East. In anticipation of this, the paper reports the construction of an air port at Leningrad :—

“ Leningrad, the World's Biggest Air Junction.

“ The Leningrad air port will be one of the best. Close to it there is being erected a big air station and hydro-aeroplane port. All buildings must be completed not later than 1931 and the complete air port (including air station and base) by September 15th, 1932.

“ The hydro-aeroplane port will be laid out in a style which is the last word in aero-technique. Here there will be built hangars, two slipways, a hydro-plane station, capable of accommodating 920 people, towers for light signalling, a factory, kitchen, garage, living quarters for flying personnel, radio and meteorological stations.

“ In the future, Leningrad will have one of the world's biggest transit main line junctions for aerial communications with Europe via the U.S.S.R. (Leningrad) to the Arctic, America and Far East (Japan, China and India).

“ The aims of the Leningrad junction are the development of their own local light-powered aircraft. It is known that until recently Leningrad played but a small part in the development of air traffic with Moscow, Ukraine and White Russia and other places in the Soviet Union. Now, in connection with the organization of the International Aero-Arctic Company and dirigible lines via the U.S.S.R. to America, its rôle will be greatly changed. The last flight of the Graf Zeppelin via the U.S.S.R. to the Arctic Ocean and to America have proved the safety of possible dirigible lines. Finally, there is also the impending opening of the air lines Leningrad—Vitebsk—Kiev ; Leningrad—Archangel—Murmansk—White and Barents Seas to Franz Josef Land and back.

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COUNT ZEPPELIN. By MARGARET GOLDSMITH. With a Foreword by HUGO ECKENER. (Cape, 7s. 6d. net).

This is quite a readable biography of an interesting man. Ferdinand von Zeppelin took part in the American Civil War, fought in the Austro-Prussian War (on the Austrian side) and in the Franco-German War. He rose to the rank of Brigadier, and retired from military life at the early age of fifty-two. Thereafter, at his home on Lake Constance, he devoted himself entirely to the design and building of dirigible airships.

To those whose chief interest would lie in the study of the technical and scientific problems by which Zeppelin was encountered, in the methods by which he solved them, in the successive improvements which he introduced, and so forth, this biography has little to offer. It is a study of the man rather than of his work. It is entirely pleasant and decorous, and says any number of kind things about him. But Count Zeppelin was one of the greatest figures in the whole history of aeronautics, and as such he deserves a more serious and critical biographer than he has here found.

A. L. M.

METAL AIRCRAFT CONSTRUCTION. By M. LANGLEY. (Gale & Polden, Ltd. Price 15s. net.).

The need for strength and reliability in aircraft, combined with lightness of construction, has produced a science which, although an offshoot of the general problem of structural engineering, has achieved such importance as to be almost independent of its parent study. Aircraft in metal present to the designer far greater problems than the mere cutting down in weight to compare favourably with wooden construction, and the refinements and improvements seem to be limitless in their possible extent. Metal construction of aircraft demands, for example, a special line of research from the metallurgist who is ever seeking to produce steels and alloys bearing such properties as will particularly suit even a small section of the whole structure. Welding, despite much controversy, is rapidly gaining popularity, although it requires much skill and careful supervision.

The author of "Metal Aircraft Construction" states in his introduction that the book is written for the draughtsman engaged in detail design who seeks to know "how the other man does it" and for the constructor weighing the pros and cons of any particular system. But its sphere of utility does not end there. The pilot, although he cannot afford the time to be a specialist in every branch of aeronautics, cannot but profit from the useful insight into the details and difficulties of construction which this book will give him, while it is indispensable to the ground engineer. Such factors as vibration and corrosion, though they can to a certain extent be predicted and overcome, are enemies alike to designer and pilot in the fatigue and structural weakness which they cause.

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 - 16/9/27 : 40 minutes' flying at Calshot.
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 - 4/10/27 : Shipped to Felixstowe.
 - 21/2/28 : Dispatched to the Gloster Aircraft Co. for conversion for training purposes (top centre section raised).
 - 9/7/28 : Returned to Felixstowe.
1929 Schneider team assembled at Felixstowe in November, 1928, and commenced their high-speed training on this machine and Gloster IVB.
Flying at Felixstowe, 2 hours 54 minutes.
 - 18/3/29 : Returned to the Gloster Aircraft Co. for reconditioning.
 - 7/5/29 : Delivered to Calshot. Training for race.
Flying at Calshot, 5 hours 24 minutes.
 - 25/10/29 : Returned to Felixstowe.
Research flying at Felixstowe, 12 hours 37 minutes.
 - 7/2/31 : Dispatched to the Gloster Aircraft Co. for reconditioning.
 - 25/4/31 : Returned to Felixstowe when 1931 Schneider team assembled.
1931 team carried out initial high-speed training on this machine.
 - 2/5/31 : Moved to Calshot. Used for nearly all high-speed turning research and for general practice and training. Flying carried out, 18 hours 16 minutes.
 - 11/9/31 : Returned to the Gloster Aircraft Co. for reconditioning.
- | | |
|--|-----|
| Number of flights during 1929 training period ... | 19 |
| Number of flights at Felixstowe on high-speed training ... | 55 |
| Number of flights during training for 1931 race ... | 73 |
| Total number of flights by high-speed seaplane N.222 since the beginning of the training period 1929 is, therefore ... | 147 |

It is pointed out that several pilots had had very little experience of high-speed flying before going on to the Gloster IVA.

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Of the various courses on the schedule, the Blind-flying Course is attracting special attention and three pupils have already qualified for the A.S.T. Certificate of Competence, while three others are now receiving instruction in this form of flying. Several more are undergoing the Instructors' Course and three others, who contemplate making Aviation their profession, are taking long courses of from one to two years' duration. By the end of their training, these pupils will have qualified for their "A" and "B" Pilots' Licences, have completed a Blind-flying Course and have been coached in technical subjects which will bring them up to the standard of the "A" and "C" Ground Engineers' Licences and the 2nd Class Navigators' Certificate.

Practice in night-flying forms part of their course and a number of pupils who will be taking the tests for their "B" Pilots' Licence shortly, have already received the necessary instruction.

The Staff of the School has been augmented by Mr. A. R. O. McMillan, who, besides having a Central Flying School "A.I." Instructors' Certificate, is a specialist in Navigation. On the technical side, the staff also includes highly qualified instructors in Rigging and Engines.

The School machines now consist of four Atlases, one Siskin, three D.H.9J's, two Avro Tutors and three Avians, all of which are kept busily engaged. With the completion of the slipway, seaplane instruction has been started.

As the School undertakes the overhaul of its own engines in the specially equipped shops, pupils receive the most practical form of instruction in the care and maintenance of the engines they use.

The engine-house for the testing of Jaguar, Lynx and 7- and 5-cylinder Genets is in course of erection and will make the School a completely contained unit. Among other developments recently completed is the squash court, which has a gallery, maple floor and latest form of B.T.H. flood-lighting. The second block of sleeping quarters has been finished and so makes a total of twenty-six rooms available for pupils.

Arrangements have also been made for enlarging the aerodrome by incorporating a field in the north-east corner, and negotiations have been made for the use of forced-landing grounds away from the aerodrome.

The School seems likely to draw its pupils from all over the world, for inquiries have been received from such distant places as America, Argentina, Canada, Egypt, Finland, Germany, Holland, India, Latvia, Nigeria, Sweden and Yugoslavia.

An interesting sidelight on the position is afforded by the number of parents who are looking into the question of flying training with a view to their sons taking up Aviation as a profession.

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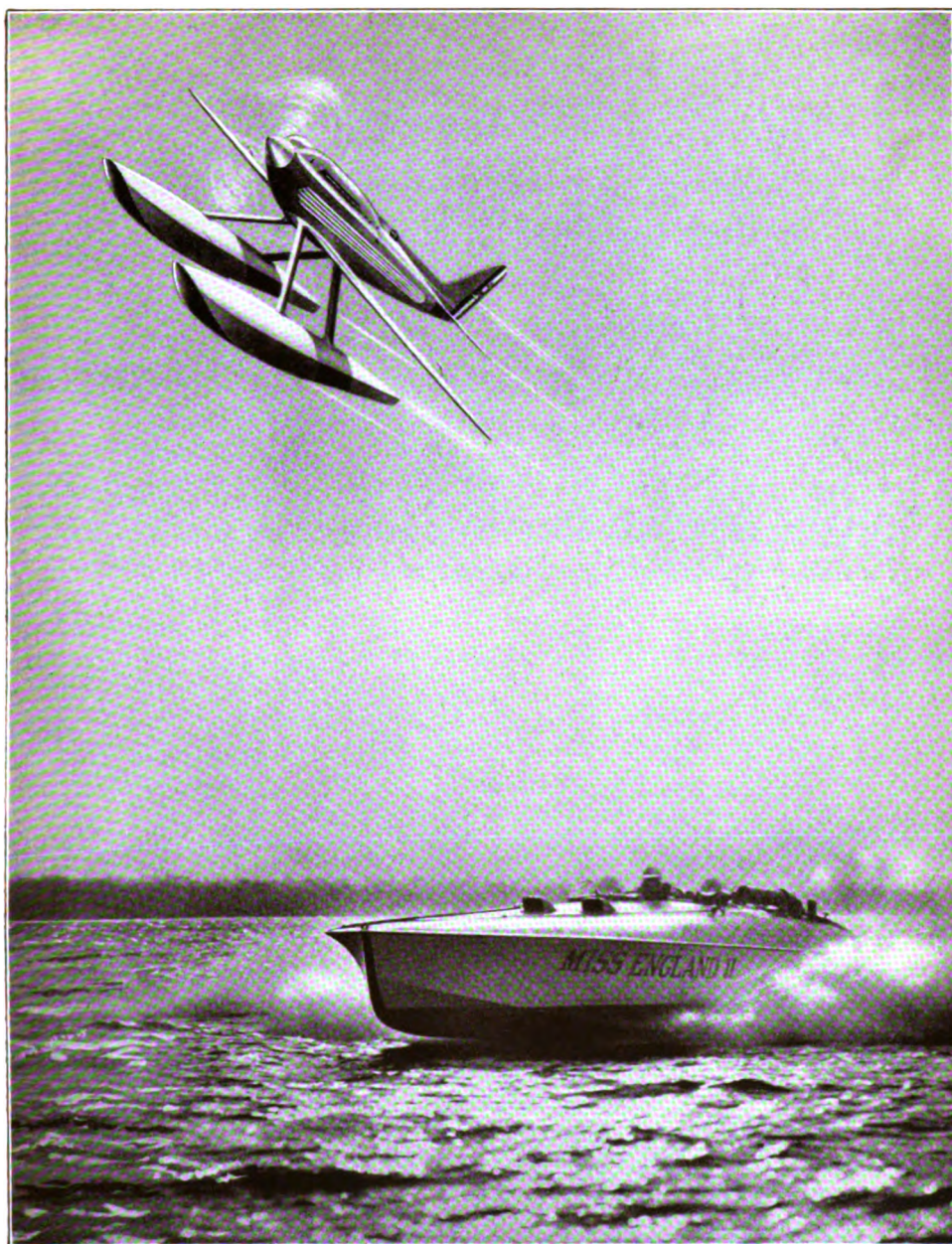
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(See article on page 214.)

THE GRAND STRATEGY OF ALEXANDER THE GREAT

ARTICLE II.

BY MAJOR-GENERAL J. F. C. FULLER.

8. THE SEARCH FOR A NORTHERN FRONTIER.

THE wealth of India in legend, fable and fact has acted like a magnet on all would-be world rulers. Dionysius, Semiramis, Sesostriis, all more or less legendary conquerors, had been attracted eastwards, and so, in his turn, was Alexander, and after Alexander many another right up to the days of the Moguls, of Napoleon and William II of Germany. The road was now unbarred, Persia was at his feet, and had Alexander been but a robber chieftain, little prevented him moving straight on the Hindu-Kush and the Indus and over-running the rich plains of India and plundering her cities.

His object was not, however, to loot the world, but to consolidate a world empire. The greater this empire was, the more impregnable must its frontiers be. To consolidate Persia he must establish a secure northern frontier. He must, therefore, advance into Parthia, Bactria and even Scythia, and not only impose his will on the barbarians who roamed over these vast regions, but establish a secure line of defence. Further, this line would shield his left flank and his communications when the time came for him to march on India.

Though strategy is a modern term, and though strategical thought is conspicuously absent among the soldier writers of the classical period, Alexander's strategic sense has never been surpassed. Everything he did was done to further his object, nothing was done in a haphazard, casual or indecisive manner. Throughout the "Anabasis" of Arrian, we watch a complete and gigantic plan unwind itself in the course of twelve years. First, it is the establishment of tranquillity at home, then sea power, then land power, then political power, and finally an all embracing security which will allow of peace, contentedness and prosperity.

To return to Alexander. Bessus had escaped and he must be followed, for he was a danger point; but though Alexander was burning with a just rage against the regicide, this in no way upset his mental balance. Before following the assassin he turned northwards to the Caspian in order to conquer the Mardians, Hyrcanians and other hill tribes and so

protected his flank. Strategically Alexander never pushes straight ahead until his flanks are tactically secured. Having subdued the Caspian region, he next marched eastwards, and then southwards to lake Zarangæ, which is situated on the northern outskirts of Gedrosia, reducing all the tribes met with to subjection. He founded cities and established garrisons and then turned northwards from Alexandria in Arachotia (Kandahar) and marched towards the river Cophen (Kabul river) as he had learnt that Bessus had sought refuge behind the Parapamisus (Hindu-Kush). In the winter of 330-329 B.C. he reached Nicea (Kabul) and as the snow choked the passes over the Hindu-Kush he kept his troops from mischief by employing them in building another of the many cities bearing his name, namely, Alexandria ad Caucasum (near modern Beghrum).

In the early spring of 329 B.C., Alexander and his entire army crossed the Hindu-Kush by the Khawak Pass, surely one of the most astonishing marches ever made, a greater feat than those of Hannibal and Napoleon. From the Khawak he descended into Bactria, crossed the Oxus and then proceeded by forced marches through Sogdiana covering 150 miles in four days. The reason for this abnormal speed of nearly forty miles the day was that he heard that Bessus had sought refuge with Spitamenes amongst the Sogdians. Whenever Alexander neared his prey he always moved with the utmost rapidity in order to forestall the news of his advent. This march was successful, for Ptolemy, one of Alexander's most noted generals caught the murderer hiding in a village and tying a halter round his neck brought him naked to Alexander, later on he was executed.

Having refitted his army, for many horses had been lost in the mountain passes, Alexander next marched into Scythia (Tartary) and after overcoming the Sogdians and Scythians founded Alexandria Ultima (Khojend) on the Jaxartes.

This town was the most important of a number of fortified posts which Alexander established and garrisoned in this region, which he recognized as a suitable one for his northern frontier. Whilst this work was in progress, Spitamenes fomented an insurrection among the Sogdians, who annihilated a detachment of some 2,000 Macedonians. When Alexander heard of this defeat he at once set out to revenge it. In a three days' march he covered 170 miles and swept over the length and breadth of Sogdiana "like a blizzard" putting to the sword 120,000 men without counting women and children. Spitamenes escaped, but a little later on was assassinated by the Scythians.

If we judge this massacre from present-day standards of morality it is a ferocious act, but to do so is to mis-read history. In Scythia Alexander's outposts were thousands of miles from their base, and the native inhabitants were true barbarians. The frontier between the

Scythian mountains and the southern shore of the Caspian was defensible only if secured by posts. As these posts could not be otherwise than small ones, Alexander stabilized them by striking such terror into the hearts of the natives directly the first was destroyed, that throughout the rest of his reign, this frontier, as far as we know, remained secure.

At first Alexander was under the impression that the Caspian Sea was part of the ocean, but learning that north and north-east of it lay countless miles of territory inhabited by barbarians he determined to call a halt, and in place of continuing his conquests in a northerly direction he thought better to form an alliance with the Scythians. This he did, and during the winter of 328-327 B.C. he consolidated his frontier by reducing the few remaining strong points which were holding out and by establishing a secure administration in the conquered territories. Further, to bind Bactria to him, he married Roxana, the daughter of the Bactrian chief Oxyartes, who had opposed him at the Sogdian rock. Of Roxana, Arrian tells us, "No sooner did Alexander see her than he fell in love with her; but though he was in love with her, he refused to offer violence to her as a captive."* I quote this, because it is from such incidents, rather than from massacres such as that of the Sogdianians, which were normal occurrences in his day, that we can best judge the moral standard of Alexander as man and soldier.

The northern frontier was now established. It ran from the Black Sea through the watershed of the Euphrates and Tigris along the Caspian Sea, through Hyrcania to the Oxus and thence to Alexandria Ultima on the Jaxartes; from here it ran southwards to the Hindu-Kush. Seeing that in the days of Alexander there were no maps and no knowledge, save the vaguest of legends, of the countries north of this line, this frontier is a remarkably well chosen one. That Alexander was not altogether satisfied with it we learn from the fact that he told Pharasmenes, the king of the lands between the Caspian and Ural (Aral) seas, that, after he had conquered India, he would return to Greece and thence advance through the Bosphorus and Euxine Sea, when he would be glad to seek his assistance, presumably in the conquest of the country north of the Caucasus mountains and the Caspian.

9. THE SEARCH FOR AN EASTERN FRONTIER.

In the late spring of 327 B.C., Alexander, following the line of advance which legend affirmed had been trodden by Bacchus and Hercules, set out for India at the head of 135,000 men. Many of these were Orientals but the backbone of his army remained Macedonian and with this army proceeded large numbers of camp followers, slaves and women. When we think of this extraordinary host, not a mere nomadic horde, but a highly disciplined force capable of undertaking

* "The Anabasis of Alexander," Arrian, IV, XIX.

some of the most rapid marches in history we are struck with astonishment. How was it administered we may well wonder, but of its services next to nothing is recorded, yet they must have been most highly organized to be able to supply this army, this "moving capital" as Colonel Dodge calls it.

As Alexander neared the river Cophen (Kabul River) he sent heralds ahead ordering the mountain chieftains to report to him and provide him with hostages. This they did, nevertheless the following winter was spent in various mountain campaigns.

At Nicea (Kabul) Alexander divided his army, sending one half under Hephæstion and Perdikkas down the Khyber; whilst heading the other half himself he marched by a more northern road in order to reduce the mountain tribes and so secure the main route down the Cophen. The southern column debouched from the Khyber and halted on the Indus at Attock, the northern at the rock of Aornus in the Swat country some sixty miles further north. Having built a large number of boats, he crossed the Indus at Attock and from there marched towards the Hydaspes (Jhelum). Finding that the river was unfordable, and that Porus, the Indian King,* was holding the left bank with a great army, "he sent Cœnus, son of Polemocrates, back to the river Indus, with instructions to cut in pieces the vessels he had prepared for the passage of that river, and to bring them to the river Hydaspes."† This was done, and, in 326 B.C., the battle of the Hydaspes was fought and Porus was defeated.

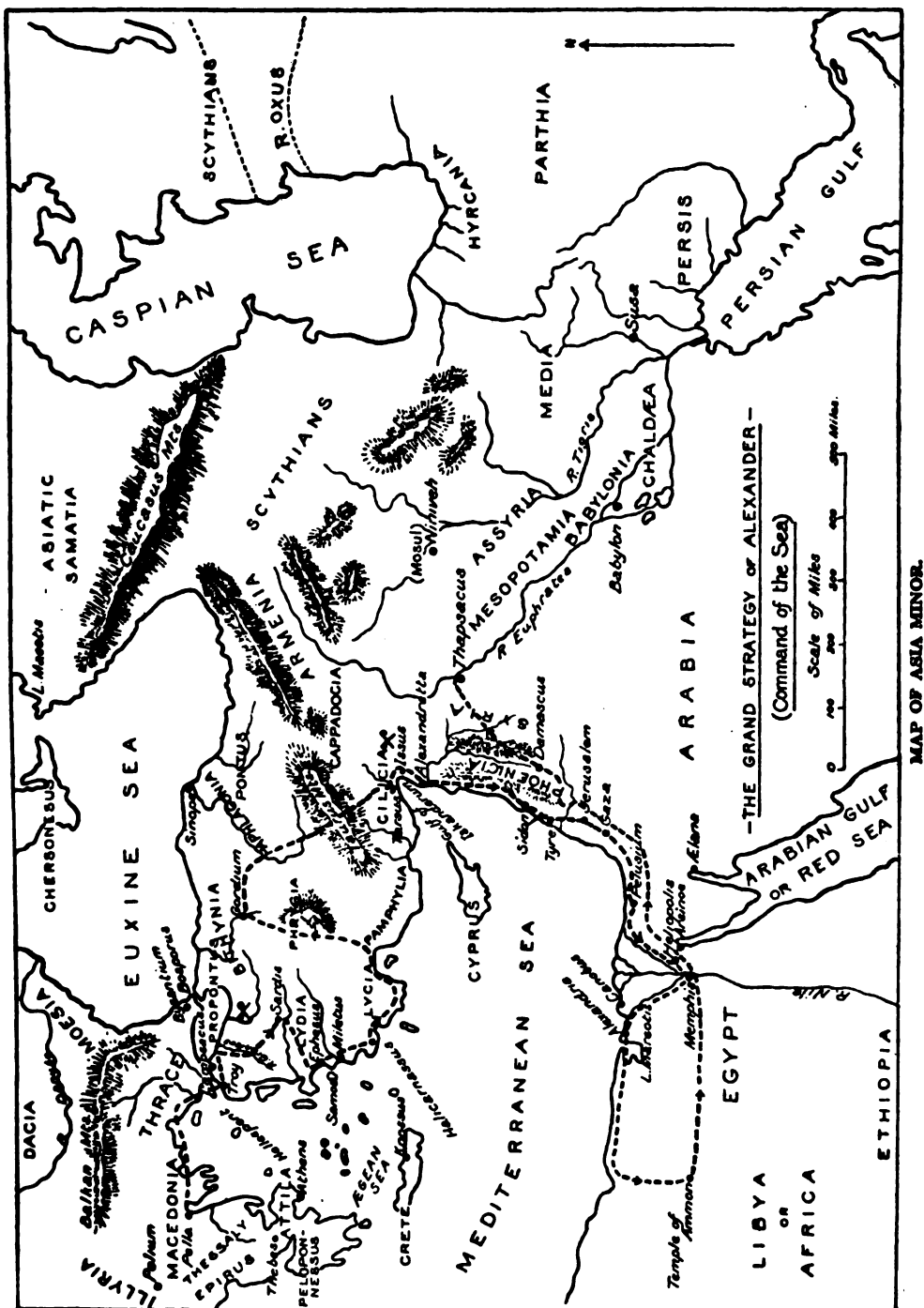
After this victory, Alexander's behaviour was strictly consistent with his general policy. The aim of his grand strategy throughout, and I will repeat it again, was to control the local governments without upsetting the existing administration. To attain this object it was necessary for him to gain military control, for by so doing he was able, through the local Governments, to rule the people who he always preferred to look upon as allies rather than as conquered races.

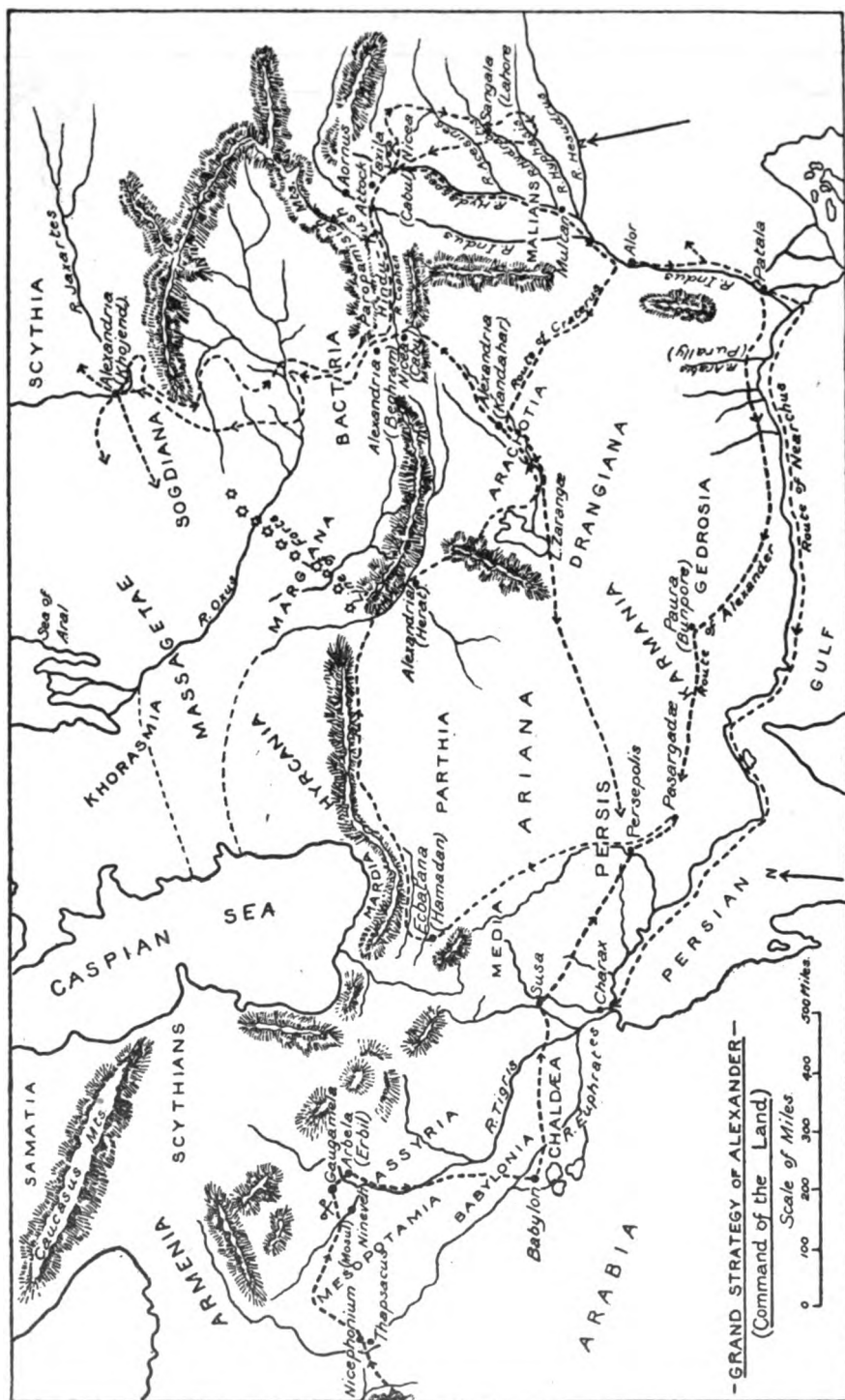
After the battle of the Hydaspes, Alexander not only gave back to Porus his kingdom but increased it in size. Simultaneously he raised Taxiles, a neighbouring king, to equal power, so that these two men should balance each other's influences. Not by reducing the conquered to a state of feebleness but by creating numbers of strong and mutually suspicious principalities, such was the secret of Alexander's system of control.

From the Hydaspes, Alexander marched on Sangala (Lahore) and reduced this city, then he crossed the river Acesines and headed his army towards the Hydraotis (Ravee) and then on to the Hyphasis

* His kingdom lay between the Hydaspes and Acesines (Chenab) with Sangala (Lahore) as its capital.

† "The Anabasis of Alexander," Arrian, V, VIII. This I believe to be the first mention in military history of pontoons.





MAP OF PERSIA.

-GRAND STRATEGY OF ALEXANDER-
(Command of the Land)

Scale of Miles.

(Sutlej). His intention apparently was to reach the Ganges and move down it to the sea, which he supposed (and rightly so) would provide him with his ultimate eastern frontier.

It was now eight years gone since Alexander had set out on his conquests, and the army had marched some 17,000 miles. Not only were the men weary and home-sick, but the Indian climate was steadily sapping their vitality. On the banks of the river Hyphasis they refused to go further. At first Alexander would not listen to the appeals of his men. He says:—

“ But, if we now return, many warlike nations are left unconquered beyond the Hyphasis as far as the Eastern Sea, and many besides these and Hyrcania in the direction of the north wind, and not far from these the Scythian races. Wherefore, if we go back, there is reason to fear that the races which are now held in subjection, not being firm in their allegiance, may be excited to revolt by those who are not yet subdued. Then our many labours will prove to have been in vain; or it will be necessary for us to incur over again fresh labours and dangers, as at the beginning”^{*} These words clearly place before us the pith of Alexander’s policy—the establishment of secure frontiers. Coenus, nevertheless voices the opinion of the army. They can go no further “ return of thy own accord to thy land, see thy mother, regulate the affairs of the Greeks, and carry to the home of thy fathers these victories so many and great. Then start afresh on another expedition, if thou wishest, against these very tribes of Indians situated towards the east; or, if thou wishest, into the Euxine Sea; or else against Carchedon (Carthage) and the parts of Libya beyond the Carchedonians.”[†]

Alexander submits to the will of his men; they crowd round his tent “ because by them alone he suffered himself to be conquered.”

10. THE SEARCH FOR THE SOUTHERN FRONTIER.

With the sun to his back, Alexander sets out on his return journey. On the Acesines he is met by reinforcements from Greece: 30,000 infantry, 6,000 cavalry, bringing with them 25,000 suits of infantry armour and 100 talents of medical drugs.[‡]

This constant arrival of reinforcements is one of the most astonishing proofs of Alexander’s administrative ability. His lines of communication must have been superbly organized, for large and small parties travelled thousands of miles unmolested. One of the most astonishing events to my mind, related by Plutarch, is that, whilst in Bactria, Alexander “ had a present of Grecian fruit brought

^{*} “ The Anabasis of Alexander,” V, XXVI.

[†] *Ibid.* Bk. V, XXVII. In Phœnician Carthage is Carth-chadatha or “ new city.” The old city was, of course, Tyre, the oldest Sidon.

[‡] Diodorus XVII, 95.

him from the sea coast, which was so fresh and beautiful, that he was surprised at it."* To send fresh fruit from Athens to Khojend would, to-day, require a more than ordinary Quartermaster-General.

Alexander's object was now a definite one. If circumstances did not permit of him establishing the secure eastern frontier he had set out to find, he had no intention of marching home the way he had come. He knew the Indus ran into the sea, he had a vague idea that it was the same sea into which the Euphrates flowed. If so, then it would be of inestimable value to his empire to establish a trade route from the mouth of the Indus to Babylon.

The difficulties which faced him in this projected voyage of exploration are to-day hard to realize. Outside legend he had no information to work on. So little was known of geography† that because the lotus bean was found growing on the banks of the Acesines and crocodiles were seen in the Indus, at the time the Macedonians thought that they had discovered the sources of the Nile! Nothing, however, deterred him, and he advanced into the unknown far more completely than ever did Columbus.

The Indus he realized would make a good eastern frontier to his empire if only he could link up by sea its mouth with that of the Euphrates, for then the deserts of Persia and the Hindu-Kush could be circumvented. His strategy was thoroughly sound and to it he added an acute economic foresight.

The preparations for the homeward journey were made on the banks of the Hydaspes. The army was divided into two wings, one marched down the banks of the river and the other embarked in some 2,000 vessels: "The noise of the rowing was never equalled on any other occasion, inasmuch as it proceeded from so many ships rowed at the same time; also the shout of the boatswains giving the time for beginning and stopping the stroke of the oars, and that of the rowers, when keeping time together, they made a noise like a battle-cry with the clash of their oars."‡

This journey down the Hydaspes and Indus is full of interest, but I cannot describe it here. At the junction of the Hydaspes and the Acesines the Mallians (capital Multan) were subdued, and Alexander nearly lost his life. Having appointed viceroys over the conquered territories, at, or near, Alor he despatched half his army under Craterus, via Alexandria (Kandahar), back to Persepolis and with the remainder continued his journey down the Indus subduing the nations on his way.

The mouth of the Indus was fully explored, and Hephæstion was ordered "to prepare what was needful for the fortification of a naval

* Plutarch's "Lives." "Alexander."

† All he had to go on was Herodotus, who mentions some vague journeys between India and the Red Sea (Persian Gulf).

‡ "The Anabasis of Alexander," Arrian, VI, II

station and the construction of dockyards " for Alexander determined to establish at Patala (? Haiderabad) a permanent naval base. Then came the great decision.

Where did the sea coast, west of the Indus, lead to? Was it to the Persian Gulf, or around Arabia or Africa; no one knew. Legend affirmed that Semiramis had made war on India and that on her journey home through Gedrosia (Baluchistan) her entire army had perished in the sands. Alexander now determined to follow the same track at the head of a large force of men, whilst his fleet, under Nearchus, sailed along the coast.

Many historians have blamed Alexander for selecting this difficult land route, but most of these writers overlook the fact, that as the fleet would have to anchor along the shore every night, it was impossible to provision it because depots of food and water did not exist, unless a large force marched along the coast-line to dig wells and collect supplies. This is confirmed by Nearchus who says "that he turned his march this way for the purpose of conveying provisions near the fleet."*

In the winter of 325 B.C., Alexander crossed the river Arabis (Purully) at the head of 35,000 men, but by the time he reached Paura (Bunpore) over half his army had perished in the desert. Nearchus successfully completed his journey, and by doing so established the southern route between the Indus and the Euphrates.

II. CONCLUSIONS.

Such in brief is the story of Alexander the Great's conquest of the known world of his day, or rather the known world and much that was still unknown to the Greeks. In itself it is one of the great, if not the greatest, of world dramas, and to the military student it constitutes a microcosm of grand strategy, for practically everything of importance regarding this subject is crowded into twelve memorable years.

The first thing to note is that Alexander's strategy does not simply aim at accomplishing a tactical success—a victory; but of developing a policy through victory. If by strategy we mean the logistical movements of armies without reference to the economic and political objects of war, and this is the common conception of strategy, then indeed not much is to be learnt from the 22,000 miles marched by the army of Alexander. But such a narrow view can teach us next to nothing, because war is a means to an end, the end being a more perfect state of peace. Alexander was a Greek, or rather a Macedonian Greek, his tutor was the philosopher Aristotle, he firmly believed in the superiority of Greek civilization over Persian, he saw that the Greek

* *Ibid.* VI, XXIV.

republics and kingdoms were sixes and sevens, that they could not endure unless they were consolidated and their frontier pushed out to rest on secure obstacles. Then, he attained his vision of a World State, a League of Nations, a federated world. This is clearly seen in the last year of his life (323 B.C.), when at Babylon he turned his thoughts towards blending West and East, and schemed out vast commercial projects. And this is why, at the beginning of this study on his grand strategy, I dealt with the events of 323 B.C. before examining those of 334 B.C.

The purely strategical part of his plan, namely, the establishment of unattackable frontiers, or frontiers difficult to attack, was comparatively simple to the establishment of the grand strategical base upon which this security could be founded. He knew that it was quite useless to set out to conquer the world unless its many peoples were agreeable to accept him as their overlord. He, therefore, through thick and thin, maintained his ethical and political objects. His rule was not to be established solely on physical force, but in the hearts of the conquered people. He treated them not in a barbaric but in a "kingly" way. He knew that the Persian rule was corrupt, that the people were weary of it. He determined that his rule should not be corrupt; but he realized that what people love best is to rule themselves, therefore, bit by bit, as he smashed the Persian power, he did not attempt to introduce the conception of Greek democracy, but replace the former national constitutions. In brief, he said to each conquered people in turn: "Rule yourselves in your own way, worship your own gods, do as you like; but one thing I insist upon, there shall be no disorder, and to guarantee law and order I shall leave a small garrison with you, and its cost will be met by yourselves." Had such profound insight into government possessed the world conquerors and world powers which succeeded him, I cannot help feeling that long before this present century the great Macedonian's dream would have come true, and the world to-day would be a federated unit.

To turn now to his system of conquest. In war, as in mechanics, a lever to be of use requires a fulcrum. Greece was his fulcrum, and it had to be converted into a stable one before his army, the lever, could overthrow the Persian Empire. The establishment of this fulcrum was the main part of his problem, for the lever he had inherited from his father. What did this main part entail?

First the acceptance of his rule by the Greek states. This he accomplished by establishing a terror, and I cannot see what other "implement" he could have used. He knew that terror rapidly loses its adhesive quality, and that the true consolidator of a nation is contentment. That contentment demands, besides a certain amount of freedom, sound economic foundations, wealth in place of poverty, as

well as security in place of danger. Here were two problems, namely, the control of the cornmarkets, which could only be accomplished by destroying Persian naval power, and the establishment of secure frontiers, which could only be accomplished by destroying Persian military power. We have seen how he solved both these problems. Though he had no fleet worth talking about when he set out on his great adventure, by attacking the Persian naval bases he not only destroyed the Persian sea power, but won it for himself, for, as he had foreseen, the Phœnicians would come over to his side. This at once led to mercantile supremacy; for directly the command of the sea was his, Egyptian corn would flow freely into Greece. Then and then only did his strategy become offensive, and he set out to gain command of the land.

It is true that Alexander's empire fell to pieces immediately after his death, and that his dream was never realized. Yet so masterful had been his work, and so deep-rooted the foundations he had laid, that his conquests altered the whole course of history, and in the Hellenistic age which followed his own were laid the main foundations of the Roman Empire, in which, to a limited extent, his world ideal took form.

From this brief study we can learn the following grand strategical lessons: that a war is not truly won unless it ends by establishing a better form of peacefulness; that unless a firm base of action, a fulcrum, can be established, any serious reverse may lead to a revolution; that naval and military power are complimentary; that financial resources are all-important, and last but not least that unless all the many parts which go to build up war are set together in their proper relationships by one man, or by one planning organization, economy of force cannot result.

(Concluded.)

THE CRUISE OF No. 202 (F.B.) SQUADRON, 1931

BY FLIGHT-LIEUTENANT H. MOUNTAGU WHITTLE, R.A.F.

[Early in May it was my good fortune to be given temporary command of 202 (F.B.) Squadron (Fairey III Fs.) and detached from R.A.F. Headquarters Mediterranean for that purpose.

The Squadron had arisen from the ashes of 481 Flight, in both of which I had previously served.]

THE OPERATION ORDER.

"It has been decided that the aircraft and a limited number of personnel of No. 202 (F.B.) Squadron will proceed on a cruise to Aboukir during the summer of 1931, as part of its annual training. The objects of the cruise are to investigate the manner in which the Middle East Command could be reinforced by aircraft should need arise, and to exercise the Squadron in its principal war functions, namely, operating from advanced bases, formation flying, accurate course keeping, and in pilotage and communication in all its branches."

PREPARATIONS.

The preparatory period of a flight of this description rarely seems too long. Endurance tests, W/T tests, full-load tests fill in the day from dawn to dusk. The distribution of fitters', riggers', and personal kit, has to be painstakingly worked out, that the uttermost ounce of each aircraft's useful load may be used. And last-minute exchanges of floats, radiators, and generators, engender an attitude of mind eager to exchange the word for the deed, and the printed form for the stainless eminence of the air. So that when the first aircraft went down the slipway at 0545 hours on July 14th, and the remainder showed no *a priori* grounds why they should not do likewise, I felt relief at leaving the comfortable provision of daily life, and at embracing the opportunity of leaving an island whose not very vast circumference I had traversed (almost daily) for years.

NARRATIVE.

The first objective was Corfu, with an intermediate refuelling at Augusta.

None could take exception to the weather conditions in Marsa Scirocco Bay as the six aircraft taxied out and took off in open formation.

A decision was made to dispose the squadron, when airborne, into two flights as nearly as possible self-contained, "A" leading and "B" remaining within visual distance. In the event of an involun-

tary descent the intact flight was to proceed according to programme, and the senior officer of the flight concerned was "to deal with the situation according to the prevailing circumstances, and as his judgment dictated."

Not more than twenty minutes had elapsed before I had the opportunity of observing what circumstances prevailed and wondering, with some interest, what my judgment would dictate. The circumstances were provided by S.1382 dropping out of the formation without warning, and alighting perfectly in the middle of the Malta Channel. Conditions were not ideal for this feat, as the wind was blowing strongly enough in the direction of a considerable swell to exclude the possibility of a satisfactory cross-wind and along-the-swell landing. It was therefore with great relief that I saw the fitter on the floats shackling on the drogues and at the same time getting rid of superfluous matter in a manner not unknown to those who travel by water. R.A.F. Headquarters was informed and a general S.O.S. broadcast. Visual communication from S.1382 was unsuccessfully attempted, pitching and rolling preventing any sustained alignment of the Aldis lamp. Thus it was not till later that we heard the reason for the forced landing.

I had previously noticed one of H.M. ships leaving Valletta, and though she was invisible from a thousand feet I decided to climb, in company with 1380, to a height from which I hoped to take her bearing. In process of doing this we sighted a merchant ship some ten miles to the Northward, and for her we steered. She flew the Italian flag, and at first appeared to take no notice of our repeated S.O.S. by Aldis, but at a time when one felt at a restraint being unable to be everywhere and do everything, the smallest delay seemed unduly protracted. In point of fact she flew an answering pennant (being unable to reply by lamp) in a remarkably short time. The aircraft on the water was out of the ship's and our sight, so flying back we circled over her and the huge patch of oil with which she had polluted the ambient blue, firing Very lights. Leaving 1380 on watch I returned to the Italian who had altered course and was comfortingly belching out great clouds of black smoke. By this time H.M.S. "Abingdon" (opportunistically manned from H.M.S. "Glorious" who was in dock), whom I had seen leaving the harbour was also making full speed for the broadcast given position, and both ships could be seen steaming on converging courses, though neither, at the time, could see the aircraft. The Italian arrived first, and the situation appearing to be no longer in doubt I proceeded to Augusta, 1380 in company,* where I reported my flight's return to a less advanced state. A slight leak in 1380's radiator was discovered and this delayed

* 1382 was subsequently taken in tow to Calafrana by H.M.S. "Abingdon."

the start whilst it was being repaired. The Wing Commander decided to retain the original order of flight, but an hour out from Augusta signalled me to take the lead as 1374 was experiencing a momentary lapse from wireless grace. The white cliffs of Paxos came up two points on the starboard bow, and soon afterwards we passed the lake on the western shore of Corfu (where Maclaren forced-landed on his attempted flight round the world); past the ex-Kaiser's Achelleion; the island where Ulysses was wrecked; Corfu Town, and came down to the charming waters of Govino. Immediately, 1380, with petrol and switches "off," ran amok, cannoning off 1384 and careering round the peaceful bay until such time as she thought fit to stop, owing to lack of petrol and a seized-up engine. The leak in the radiator had spread considerably and the water had ceased to circulate.

The engine was beyond our repair and the French Air Union's offer of an asylum was accepted at once, and the refractory floatplane towed to the bottom of the slipway. Here the difficulties began, as the slip was built with raised rails and cross-ties to take flying-boat cradles which could not be adapted to take floatplanes. All the ingenuity at the disposal of the entire Squadron and the entire Staff of the Air Union was mustered before 1380 was finally "choked up" inside the hangar.*

It now became apparent that we were in evil case, the Squadron having lost a third, and "B" flight two-thirds of its establishment on the first day. Nothing deterred ("for no one venturing on an enterprise ever yet passed sentence of failure upon it") the Wing Commander signalled to Malta for approval of his intention to proceed with four aircraft, and his proposal to investigate any Athenian avenue that might lead to a Napier "Lion." The reply, concurring, added that the personal kit of the pilot and W/T operator of 1373 (which I had last miserably beheld being stowed in that aircraft clearly predestined to be the first to forced-land), would be forwarded by sea to Alexandria. This timely striking of an optimistic note left us *vivace, ma non troppo*, myself not least, for though the Corfu Orderly Officer's clothes fitted me well enough, it was more than doubtful whether those of the Orderly Officers in Athens and Alexandria could be expected to be of the same size.

The problem of what should "A" do, in the event of the whole of "B" flight (now compactly contained in 1373) forced-landing, became of particular interest to myself and my crew. The prospect of sitting on the water *solissimus*, and watching "the intact Flight proceeding according to programme," was not calculated to amuse, for though one aircraft was doubtless agreeable, yet as the prejudice had so far run in favour of three, we did not wish "to affect a singularity

* Nothing gave too much trouble to the manager of the Air Union, who continued to relieve us of unexpected embarrassments in a courteous and most pleasing way.

in that article." And so, as dusk fell, to Corfu Town, past the site of the Council Chamber where two thousand five hundred years ago the Oligarchs " conspired together, and, rushing into the chamber with daggers in their hands, slew Peithias and others to the number of sixty, as well private persons as senators "; across the Agora where " the women joined vigorously in the fray, hurling tiles from the housetops, and showing a fortitude beyond their sex "; to the Hotel Belle Venise for rest and refreshment. And the evening and the morning were the first day.

Early on the 15th we motored back along the coast road flanked by olive-covered hills set with cypresses like flames of darkness, on the one side, and the unruffled mirror of the straits on the other. So still was the morning that each aircraft perfectly reflected itself, and the little island church had a shimmering counterpart in the silver waters of Govino. The morning mist was still lying like gossamer over the wooded end of the bay, and the rosy-fingered dawn had scarcely touched the mainland mountains, when to the South " in order'd phalanx, the thin rank't squadron " plied. Then was the most enchanting flight I (and I think any one of us) had ever experienced.

Turning Easterly at Cape Oxia we chose the northern shore of the Gulf of Corinth, leaving to port the huge area of fever-stricken swamps surrounding Missolonghi (heavily engaged in some Byronic festival); Parnassus, sacred to the Muses, Apollo and Bacchus; ancient Delphi (" Here I will make me a fair temple, to be an oracle for men "), and flew above Corinth, famous for the Temple of Venus, where pleasures were sold so dear that many lovers were reduced to poverty, showing, truly enough, " that all voluptuous indulgences are attended with much expense."

To avoid the prohibited area of Salamis we approached the shores of Aegina (at one time the greatest naval power in the Aegean), where her triremes had gazed across the water with justifiable hatred, on the flashing helmet and speartip of the gigantic bronze statue of Athena, standing fearlessly on the Acropolis.

At Phaleron Bay specially constructed slipways which admitted of the aircraft being tied up alongside made refuelling simple. The Commanding Officer was soon engaged in conversations that would have resulted in a happy issue out of our Corfu difficulties, but the loan of an engine became unnecessary on the receipt of a signal from Malta, stating that they were making arrangements which should result in 1382 rejoining the Squadron at Corfu on the return journey.

That night we were the guests at dinner of the Fairey Aviation Company.

The next morning on the Phaleron road it was discovered that

the Imprest Account had been left behind, and feeling that this might be wanted at a later stage of the excursion we returned to the inn where we had spent the night and retrieved it intact.

Conditions were again favourable with a clear sky and a following wind when we left the Seaplane Base at Phaleron. Half-way to Crete was Milo, looking as desolate as when, refusing to join the Athenians, "all such as were able to bear arms were put to the sword." The wind increased and the Cretan mountains, visible eighty miles away, were reached in just over half as many minutes. In accordance with our custom at the end of each leg, the formation tightened up, but after passing the high land on the promontory, the bumps became so unusual and the behaviour of my wings so erratic, that the break-away signal was taken as read. The high mountains to the North-West of the almost landlocked lagoon of Mirabella, and high winds from the same direction, cause bumps of peculiar diversity, which from time to time have impressed the most phlegmatic aviators. On the Eastern side are small hilly islands; at the South end two windmills stand on a narrow strip of low-lying land, and to the North, a picturesque and dilapidated island castle does dismal duty as a leper colony. The shores of the lagoon abound in whetstone for razors, and there is still much chalk produced (called Creta, by the Romans and used by them to mark their lucky days in their calendar).

In past centuries the inhabitants of Crete have been detested for their unnatural loves, falsehood, piracies and robberies, but the Master of the Imperial Airway's Yacht "Imperia" stationed at Mirabella, assured me that his relations with the present generation continued to be friendly, and that so far from robbing were they, that eggs were sold for two-a-penny (a fact I found hard to reconcile with the price of breakfast on board); and so far from unnatural love, that a member of the local landed gentry, with no doubt laudable aspirations, was prepared to give one of his nubile daughters, a dot of five hundred pounds, and an olive grove, to any holder of his Majesty's commission who would ask delicately for her hand in holy matrimony. The by no means ill-favoured damsels are apparently not averse from the proposition, and I think it right that Flora and Fauna should have a place in a list of the island's amenities.

The take-off was not as adventurous as we had been led to expect, there being practically no wind on the surface of the water. The air in the mountain pass was still, and it was not until we had left the further coast, when a sequence of bumps lasting for ten miles was encountered, that we wondered why we had cavilled at the particular species near Mirabella.

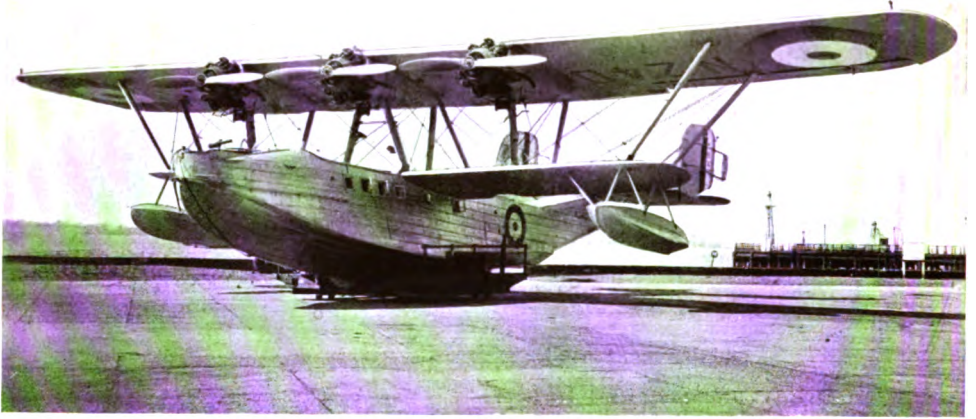
Thenceforward the visibility closed in, though the wind freshened,



THE BLACKBURN "IRIS III."
(Three Rolls-Royce "Buzzard" Engines.)



THE SUPERMARINE "SOUTHAMPTON."
(Two Rolls-Royce "Kestrel" Engines.)



THE SAUNDERS-ROE OPEN SEA RECONNAISSANCE FLYING BOAT.
(Three Bristol "Jupiter" Engines.)

11



THE SHORT "SINGAPORE II."
(Four Rolls-Royce "Kestrel" Engines.)

and I found five thousand feet the best height at which to fly. The rest of the flight was uneventful, and apart from sighting an occasional ship, and the visits of 1381 who came in close every half-hour to pass the time of day, the minutes seemed to drag by on leaden feet. The navigator tried to take our drift by casting aluminium sea-markers over the side, but they were unsatisfactory on the breaking waves. Visibility lessened and we did not pick up the Egyptian coast until within about five miles, but as we passed directly over Aboukir Camp (and I cannot resist adding, ancient Canopus, "whose inhabitants were dissolute in their manners") within two minutes of the E.T.A. signalled an hour and a-half previously, we had no complaints, and alighted.

Meanwhile, the TRX 4 W/T sets in the leading aircraft of each Flight, continued as they had begun, transmitting and receiving as well on the water as they did in the air, and keeping in good touch with Malta and Mount Batten throughout the cruise.

The following morning all aircraft were beached on the hard sand for twenty-hour inspections.

We were not scheduled to start the return journey until the 22nd of the month, so most of us took the opportunity of flying up to Cairo to be entranced by the exquisite Tutankhamun treasures in particular, and generally broiled at appositely-named Heliopolis.

The 21st was a day of tuning-up, loading the aircraft as much as possible and test flights.

The Meteorological Section forecast a North-Westerly wind of moderate strength, and low visibility, and at 05.30 hours three of us left the bay, 1384, the fourth, who all along had been making longer runs than the rest of us, refusing to take the air at the second attempt. As we awaited the third (which proved successful) water was seen cascading from 1374's radiator, but before we could invite the pilot's attention to this exhibition he shut off his engine and alighted well out from the shore; I and the remaining aircraft in formation coming down to tie up to the buoys from which we had just cast off, leaving 1384, fresh from her triumphant take-off, cruising in solitude and perplexity. While a new radiator was being rushed to the beach I transferred to 1384 (who had reluctantly alighted) for a test flight, not the least interesting part of which was the take-off lasting sixty-nine unhappy seconds. She too was beached, and the floats which had been pumped dry the day before, opened up and found to contain enough water to give an estimated overload of between six and seven hundred pounds. This was said to be "seepage," which could be temporarily remedied by pumping out immediately before flight; an unsatisfactory arrangement. It was very fortunate that the original delay occurred, for had we started off together, there is no doubt

but that the 1374 would have come down between Aboukir and Alexandria and been most certainly destroyed in the heavy sea then running.

At midday we left Aboukir in company and flew under low cloud and mist across the bight that lies to the west of Alexandria. The coast beyond is wreck-bestrewn with occasional oases and temporary settlements of nomadic tribes, and we watched with interest the frightened goats running together as though centripetally driven, and the supercilious camels pursuing their way with dignity, entirely unmoved by extra-terrestrial disturbances. About this time was signalled "202 Squadron now passing Sponger's Cove." The reply, "Why?" was not received. As the wind was from the North-West, the water at Sollum, protected by Observatory Point and the stone pier, was smooth, and all the floatplanes were beached on the sand from which many loose submerged rocks had previously been removed. The Kaimakam of the 4th Battalion Egyptian Army stationed at Sollum gave us a kindly welcome, and ordered a night guard on the aircraft.

It was our intention to take-off in the morning twilight when the prevailing Northerly wind was at its lightest, but dawn was breaking as we began to turn the aircraft round before starting up, and it is not altogether facetious to add that when the last one was afloat we were in a state approximating to that of the dawn. The difference between the efforts of four hundred and fifty horses in running a floatplane ashore, and the efforts of ten men in trying to run it off again, was never more accurately appreciated. (1384's floats were again full to the outside waterline and were pumped out at the last moment.)

When clear of the lee of the land running to the Northward of Sollum, the wind which was uncommonly fresh for that time of the day, was fine on the port bow, and a layer of clouds had formed at a thousand feet, combining to keep us low. The strong winds of the past few days had knocked up a sea which it was pleasanter to disassociate from the thought of a forced alighting. Later, the clouds forced us further down and with restricted visibility made course-keeping troublesome and constrained us to climb above them. Crete was dead ahead seventy miles off, silhouetted as though cut out of cardboard, and to my disgust and the ill-concealed amusement of the rest of the Squadron, not a cloud above us or below us remained, save a thick carpet resting on the water twenty-five miles from the shore on which it washed like slow-motion waves breaking on a beach. The north side of the island was unaffected and conditions at Mirabella perfect, the first aircraft to alight leaving tracks on the lagoon as though two heavy chalk lines had been drawn on a bright blue slate. The total quantity of petrol taken by refuelling aircraft, is

arrived at by striking the average of four dips of the petrol remaining in the tank-barge. The results of the dips, 240, 260, 240, and 260, were chalked up on the outside of the tank and the Agent, to get the average, added up the columns of figures and divided by four, the answer, 250, being accepted by us as incontrovertible. This method of working out the problem, though reliable, seemed in this instance a little circuitous, for one whose Minoan forbears had invented numerals and calculation.

At 11.30 the flight resumed, and adhering to the original intention of making a slight *détour* to take in other islands, we passed over Santorini, a volcanic formation with an enormous central crater open to the sea, surrounded by razor-like crags to which two large white towns clung precariously. In the middle of the crater was an island surrounded by discoloured water, caused by a recent eruption. Here there is some peculiar chemical property in the sea-water which not only forbids, but eliminates, the existence of marine growths. Ships arrive like Naaman the leper at Jordan, wait two or three days, and go away clean. Very poor visibility obtained and I was much disappointed that this should be as we were flying through the heart of the Cyclades, which form a sort of island bridge from the framework of the Greek continent to the islands thrown out by the Asiatic coast. Over Naxos the air was disturbed, and at Delos we sought a higher level. (Purified Delos: "henceforward no one should die or give birth to a child there, but that the inhabitants when they were near the time of either should be carried across to Rhenea, the next island.") The amphitheatre, ruins of the temple and some of the streets and houses were clearly delineated. The temple of Bacchus on Andros, with the fountain whose waters during the ides of January tasted like wine, passed unnoticed and unsung, the down-draught in the lee of the five-thousand-foot high mountains keeping us far too busily employed with other things.* About this time 1381 began flying what looked like a paying-off pennant attached to the fin. Later, it was identified with a misemployed bandage last seen at Mirabella, one end attached to the cockpit and the other to a bottle of mineral water suspended below the water for cooling purposes. Over Phaleron the formation was not sorry to break up, the heat of the day making ordinary flying unpleasant enough. All moored up with the exception of 1384, who came out of the water for an examination that discovered a rivet missing in one float, and a crack in the heel of the other. The 24th was devoted by us to inspecting the aircraft, the Acropolis and Cephissia; and by the Greek Air Force (as was their custom on Fridays) to giving air experience to their friends of the feminine persuasion (a sound method, as it seems to me, of creating air-mindedness).

* I afterwards learnt on the authority of one of the Greek naval flying officers, that given the "ideal" conditions, bumps in this particular region extended from sea-level to ten thousand feet.

The start on the 25th was comfortably late, and after diving on the Seaplane Base in formation (an evolution by which, I learn, they were graciously pleased to be impressed) we progressed favourably over the Corinth Canal and down the Southern shore of the gulf, each pilot flying more or less where he pleased. Crossing over at Patras we rounded Cape Oxia, whence to Corfu where the fifth floatplane, in sound mechanical order, awaited our arrival.

According to our time-table we were not due to leave for Malta until the 27th, which gave us Sunday free for the planning and execution of an excursion to the Achilleion (a remarkable piece of vulgarity twice as offensive because of its lovely setting), and to a bay with a deep cavern on whose floor doomed lobsters, moored up to stones, waited for the choice of "the High Officer" (presumably for the consumption of the low ones). The favoured lobsters were subsequently washed down by cool Corcyrean wine; the Squadron's natural antipathy to alcohol proving by no means insuperable. To widen other lobsters' outlook, several were collected and humanely moored out for the night in Govino harbour, preparatory to giving them air experience on the morrow. In the evening the Abbot of the fourteenth century monastery of Paleopizzati gave us his blessing and prayed that the weather gods would look favourably upon us on our last lap.

At 06.15 hours on Monday the Commanding Officer made his customary tour round the aircraft before taking off, and at 06.30 we became airborne, flew over Corfu Town to demonstrate the fact that we now had five aircraft, and passing above the low hills in the South of the islands, set course for Cape Rizzitutto. The local weather report had stated "No cloud; sea, rather, rather." The last part we were unable to confirm or deny, as for the first forty miles the face of the waves was covered with a thick blanket of cloud. When this dissipated, visibility became of the worst description and Cape Rizzitutto, wropt in mist, passed invisible to starboard, the first landfall being the high ground to the East of Cape Spartivento. A strong wind was blowing from the North through the Straits of Messina, leaving us to debate whether to stop at Augusta or fly straight on to Malta. The question was resolved on the side of discretion and we were again received hospitably by the Commanding Officer and Officers of the Seaplane Station, and each aircraft took enough petrol to place its endurance beyond doubt. At Cape Passero the strong Northerly wind died away, and a slight head-wind gave a contributory reason after the fact, for the Sicilian halt. Three-quarters of an hour afterwards the Squadron alighted in Marsa Scirocco Bay.

A congratulatory signal from the Chief of the Air Staff happily crowned the events of mid-summer, and so ended the two-hundred-and-second Squadron's Egyptian Expedition.

THE NUER CHIEFS AT KHARTOUM

BY FLIGHT-LIEUTENANT C. K. J. COGGLE.

WE had moved from our summer quarters at the "Blue Nile Mess" in Khartoum and were living under canvas on the aerodrome. Large tents like small marquees, with double linings in the top as a protection against the sun (which even in the winter makes itself strongly felt at midday), were provided for us. Our Mess was a stone building, small but comparatively cool during the day. It consisted of a central room used as an ante-room, with a dining-room on one side and a smaller one, fitted up as a card-room, on the other. All three connected with each other and also with a small veranda. In front of the Mess was a grass plot, surrounded by bushes, which was the pride and joy of the whole Mess. Needless to say, in the evenings our "lawn" was considerably more in use than the ante-room or the veranda except when we were fortunate enough to have some lively guests either from the "Fort" nearby or from visiting aircraft. Then the piano proved irresistible and the grass was temporarily forsaken.

One evening after a strenuous tennis tournament against the Sergeants' Mess, which we just managed to win, we called for chairs to be brought out, sat around on the lawn and partook of some well-earned liquid refreshment. After exhausting the tennis tournament as a topic of conversation, we found ourselves at rather a loose end for subject-matter. Things generally had been quiet lately, and except for some vague rumours from the South of impending trouble, nothing very much had happened. The flying "jobs of work" had been few and far between, and few of us had been able to get very far south of Khartoum. We were beginning to wonder whether some of us would ever be fortunate enough to go right into the heart of the elephant country, or see any of the native tribes that live there, when the C.O. appeared, evidently amused at something. We waited expectantly for some time and at last he enlightened us.

Apparently the vague rumours from the South had been only too well founded, and the Sudan Government were beginning to take quite a serious view of the situation. A witch-doctor had recently been making his presence felt in the region of the "Sud," the swampy district in Southern Sudan. He had started his activities among the Nuers (a native tribe who inhabit the Sud), and had declared himself to be more powerful than all the armies of King George. "He would

turn their bullets to water and no harm should come to any of his followers—he would bring down their aeroplanes like wounded birds by the force of his magic, and all the peoples of the Nuers would become rich, both in cattle and wives. The whole earth would be theirs . . .” and so on. Such was the reputation of this witch-doctor and of the strength of his magic that the ignorant Nuers believed every word he said. The unfortunate District Commissioner of this disturbed area was, naturally enough, beginning to get worried. It was not an ordinary rebellion which could be stamped out by fining the ringleaders so many head of cattle. This was on a larger scale altogether, and from all reports was taking on the appearance of a holy war. The very quietness of the country, and the secrecy with which any preparations that might be in progress were being carried out, were in themselves sufficient to disconcert those in authority who knew the nature of the people as well as they knew themselves.

By request of the District Commissioner, the Sudan Government had decided on an entirely new plan of action against the threatening trouble. A large number of Nuer Chiefs were to be brought up to Khartoum and shown the armament and be made to realize the power of His Majesty King George. So far, all that they had seen was an occasional aeroplane and a few primitive expeditions made up of a small body of troops. It was thought that if they were shown all the forces available at Khartoum they would lose a considerable amount of their enthusiasm for the “holy war.”

The chiefs were due to arrive at Khartoum the following week, and a suggested programme for our portion of the “intimidation display” was submitted. Our armament officer was highly delighted to be given an opportunity of proving the “super-efficiency” of his section. The programme included a squadron formation, passenger flights for the chiefs who could be persuaded into having them, dropping live bombs on the squadron bombing target, and demonstrations of the use of Vickers and Lewis guns. After that they were to go to the Fort and see the big guns shooting (it must have been years since they were last fired) and an arm-drill display. Every available man was to be turned out, including the clerks and medical orderlies, to make as imposing a show as possible.

There was almost as much preparation as for an Air Officer's inspection, and we were all agog to see these native chieftains who were causing such a stir in the hearts of the Sudan Government. Those who had been fortunate enough to have been south already were badgered incessantly by the newcomers to the squadron for information concerning the Nuers, and many and varied were the tales told. Some were true and some not so true, and some were just plain unblushing lies; but all profoundly interesting. However, we were soon to see

them for ourselves and would learn some truth about them from the District Commissioner himself, who was coming with them as guide, interpreter and "show-master."

The expected day arrived, as most of them do; we gave the last polish to our aircraft and received our final instructions. About nine o'clock in the morning, while sitting in the Flight Office, we heard a tremendous jabbering of natives, and one of our "aircraft hands" rushed in to tell us that "them Nooer blokes 'ad arrived." We turned out and saw an extraordinary sight. About fifty tall natives, some of them 6 ft. 4 in. or 6 ft. 5 in. in height, and all of them thin, wrapped in old sacks and looking rather dignified, were approaching the hangars. They were followed by a motley crowd of Khartoum street arabs and native servants, all chattering and laughing at the Nuer chiefs with ill-disguised contempt, but nevertheless keeping at a safe distance from them and their long sticks. The most striking peculiarity of the Nuers was the really exceptional length of their legs. Even the shortest of them, about six feet in height, had legs that seemed too long for his body. No doubt in the swampy districts they inhabited they found their long legs very useful. A few of them had brick-coloured hair, but, as we afterwards found out, the hair was dyed, but for what reason it was impossible to tell, except that it had been done for generations. Following closely behind them, and obviously wishing to engage in a verbal battle with the rabble, were a number of Nuer women. There were about a dozen in all, also wrapped in sacks, with the exception of one or two who were very conscious of the fact that they were better dressed than the remainder in some lengths of bright blue material. We wondered a little at the sacks until we were told that they had arrived stark naked and the sacks had been the first things the District Commissioner could lay his hands on with which to clothe them. Shortly after their arrival at the aerodrome some ordinary native clothing was brought to them, and after putting it on they looked a little less conspicuous. The women were not uncomely even to our eyes. They were much shorter than the men, the average height being about 5 ft. 6 in. or 5 ft. 7 in., and they were quite plump. In fact, they appeared to be almost of a different race. Their pride in their new clothes was not very deeply rooted, because when one of us asked the District Commissioner to tell them to stand still while we took some photographs of them, they carefully pulled aside their clothes and exposed themselves completely. The District Commissioner explained to us that they did not understand the idea of being photographed, but had got it into their heads that we were admiring them. Being very flattered to think they were the objects of our admiration, they wished to make it easier for us to see and appreciate them. Indeed, all the Nuers, both men and women,

appeared to have the mentality of children, and were most certainly savages.

We then proceeded to show them around the hangars and the aircraft. They seemed very impressed and rather fearful of touching them until the O.C. showed them that they would not bite! We pointed out to them the bomb racks and showed them the bombs, which, it was explained, would kill all their cattle if they did not behave themselves. To the Nuers their herds of cattle are all-important. Their wealth is calculated by the number of cattle they possess, and these animals provide their principal foods in the form of meat and milk mixed with blood. It is a peculiar custom, but whenever they milk a cow they also make a slight incision in the skin and mix a few drops of blood with the milk. This, they declare, makes them strong and bold fighting men. They live by and for their cattle, and without them they would starve. The cattle, therefore, provide the means for a most effective form of punishment. The Nuers themselves are extremely agile and know the swamps as well as they know the palms of their own hands, and are extremely difficult to catch in their native haunts. The cattle are not so easily moved and must be left on the patches of dry ground. Therefore, instead of spending weeks or perhaps months searching for elusive natives, only, most probably, to fail in the end, the impounding or destruction of their cattle is a quicker and far more effective way of meting out the necessary punishment.

The chiefs looked a trifle fearfully at the bombs, particularly when they were told that shortly they would be shown how it was done. They were then asked if any of them would like to fly, and, looking rather shamefaced, they started to edge away, with the exception of three, who stood their ground manfully, but not without much chatter and many reassurances from the District Commissioner, who set the example by climbing into one of the aeroplanes himself. The Nuers were finally persuaded to climb in, but only after pointing out to them what tremendous prestige and reputation for courage and bravery they would acquire. The aeroplanes being three-seater Fairey IIIFs., an officer was detailed to each one with instructions to hold the native down and, if necessary, beat him on the head with a Very pistol if he showed signs of panic or a desire to throw himself out. These precautions proved to be quite unnecessary, however, for the chiefs squatted well down in the fuselage, covered their faces with their hands, and remained absolutely motionless until they landed and the engines were stopped.

The next item on the programme was the squadron formation. It appeared that the chiefs were very impressed by the spectacle of nine aeroplanes all keeping together in the air, but were almost frightened

out of their wits by the noise when we dived past them. It was then that they asked the District Commissioner why, if His Majesty King George had so many aeroplanes, or "birds of death," as they called them, he did not wipe out the whole tribe of Nuers completely. That gave him the opportunity for which he had been waiting, and he told them something to this effect: "King George loved his people of the Nuers and they were to him like his own children, and his greatest wish was to increase their prosperity and let them live in peace and happiness. But he had heard of the naughtiness of his well-beloved chieftains and had been much distressed in his heart to think that they could be so foolish as to listen to the false lying words of an ill-begotten witch-doctor. It had been in His Majesty's mind to destroy them utterly, but he had had compassion on them, knowing that it was not the wickedness of their hearts, but only their ignorance of his power and the silver tongue of the wizard that had led them astray. He had, therefore, allowed them to live, but first he would show them, so that they could see with their own eyes, the power and strength of his hand. Thus would they return to their own land knowing well the kindness and the forgiving heart of the King, but sure that if they offended him again their cattle would be killed, their villages destroyed, and the whole land desolated."

They seemed much subdued after this peroration and appeared to take a renewed interest in the demonstrations prepared for their benefit. The bombs were dropped at a safe distance and the explosion caused much astonishment and lively argument among them. Targets were fixed up in the middle of the aerodrome and our most accurate shots were detailed to make as many holes in them as possible with their Vickers and Lewis guns, from the air. The Nuers excitedly pointed out to each other the spurts of sand behind the targets, and when these were produced for their inspection, gravely studied the holes and remarked that they were glad His Majesty loved them so well!

After the display had finished the District Commissioner told us that if we would like it the chiefs would come back to the aerodrome after visiting the Fort and give a dance for our amusement. We told him we would be delighted, and he led them off to the Fort, followed again by the rabble, which by this time had quietened down considerably and had been reduced to about half its original size. It was now lunch-time and we made our way to the Mess. Lunch was a noisy meal, as each one of us had found something amusing or interesting in the morning's show, and we were all eager to tell our own stories. The whole affair was punctuated by the sound of guns firing from the Fort. We wondered how much the Nuers were being impressed by the Army's display of armed force. When we had finished our lunch we returned to the aerodrome and found the Nuers

already there and prepared to give their dance. They were seated in a semi-circle and were chanting a wild and thrilling air. Suddenly, for no apparent reason, one young buck leaped to his feet. Snatching up his long stick, he started dancing backwards and forwards across the centre of the open space with a step reminiscent of the Red Indians in a cinema film, whirling his stick meanwhile around his head. Rushing forward to one of the squatting chiefs he rapped him lightly on the shoulder with the end of his stick. This chief now jumped up and started dancing in the same way. They made several passes at each other, using their sticks as spears, then separated and danced round the circle, meeting again in the centre and repeating their first performance. Then one by one the remainder, including the women, got up, and, leaving the first two to carry on their antics in the centre, made a circle around them. Those forming the circle performed a curious step, quite different from that of the original two. It consisted of a slight jump on the toes of each foot in turn and a sudden stretching upwards of the body. The excitement grew more and more intense, the chanting louder and louder, and the body movements more and more unrestrained. The two in the middle started whirling round at an almost incredible speed until they fell, utterly exhausted. Then the women threw off their clothes and leaped and jumped about until they in turn and the men also became exhausted. It was a thrilling sight and turned out to be a war-dance usually performed with spears instead of sticks and nearly always ending in a certain amount of blood-letting, either accidental or intentional.

When they had recovered from their exertions they prepared to return to the river steamer which had brought them up the Nile from their homes. The District Commissioner told us that they wished to say good-bye to us and had asked him to propitiate the "devils of the air," as they picturesquely described us, and assure us that there would never in the future be any need for us to visit them in anger. This did not prove to be true, however, because some little time afterwards it became necessary to give them a practical demonstration of the use of air power against recalcitrant natives. We asked the District Commissioner if it would be quite in order to give them presents. We were rather interested to see what the women would do when presented with mirrors. They had never seen any mirrors and the only time they saw themselves was in a still pool of water. He told us they would be highly delighted and it would certainly promote good feeling. A servant was hurriedly sent to the N.A.A.F.I. to procure some mirrors, but unfortunately there were not sufficient in stock. We were told that on no account must we give something to one and not to another or we would probably start a most blood-thirsty feud, because those who did not get anything would consider

themselves unforgivably insulted. Rather than keep them all waiting we told the District Commissioner that we would bring the mirrors down to the boat when we had obtained them from the native bazaar. So off they marched to the boat, followed again by the crowd, which by this time had become practically silent, after seeing the courteous way in which we treated the Nuers. Before they had gone very far, two of them returned, with the District Commissioner, who asked us to explain what all the buildings on the camp were. This rather surprised us, but we explained in detail the use of each building. After this one of the chiefs made a remark to the District Commissioner, who grinned and shook his head. They looked very surprised and then, pursing their lips and shaking their heads, they walked away to the boat.

Having procured enough mirrors and some strings of brightly coloured beads, we went down to the river and boarded the boat. On the bank were the chiefs and their wives again performing their war-dance, but this time with much less vigour and enthusiasm than they had previously shown when doing it for our benefit. They had already danced three times, and in addition the whole day had been very tiring for them. So when they had finished they threw off their sacks with every appearance of relief, went into the river and started to wash themselves with the greatest and most obvious enjoyment. They splashed themselves and each other, laughing and chattering and behaving generally like a lot of long-legged school children on holiday. After the bathe they came aboard the boat and the women produced some small leather bags and started to powder, not only their noses, but the whole of their faces as well—with ashes! They made themselves look hideous, but the men did not seem to mind; in fact, as far as we could determine, they rather liked it.

We then presented them with their beads, which they received with many squeaks of delight and much strutting about. There was even a quarrel or two about the relative values of the necklaces. The mirrors were handed to them wrapped in brown paper and string. They could make neither head nor tail of these parcels and turned them over and looked all round them, but made no attempt to open them. At last we took pity on them and opened the parcels for them. We were more than repaid for the small sum we had spent, by the looks of amazement on their faces when they saw what they thought were pictures of themselves. They turned them over and looked at the backs, looked over one another's shoulders and then again at their own mirrors. One of them tried her hardest to take the mirror of another in exchange for her own. Her reason was that she considered the other to be better than hers, because it had two people in it, whereas her own had only one. She was of the opinion that, as her husband

was the bigger and more important chief, having more cattle and wives, she by rights was entitled to have the better present. The District Commissioner settled the argument, temporarily, by looking over her shoulder and showing her that her present was really the better of the two because it had a picture of himself in it, and what could be better than a picture which showed herself and the District Commissioner together. The lady was somewhat mollified, but still not quite reassured, and her spiteful glances did not augur well for the future comfort of the other.

The District Commissioner seemed much happier in his mind than when he first arrived, and indeed he assured us that the effect of our display and of the big guns and arm drill at the Fort had considerably impressed the Nuers and eradicated, at any rate for the time being, the major portion of their desire to make trouble. Their questions had been very naïve and he had derived much quiet amusement from them. They had been dumbfounded on learning that the aeroplanes and troops they had seen were only a very small portion of the total number under the command of the King, and could not realize that their country was only a small portion of the general scheme of things. They realized vaguely that England was some distance away and that many people lived there, but previously they had looked on the English as a neighbouring tribe who were more powerful and stronger in magic than themselves, and had not thought any more about it. The noise, smoke and light that a bomb produced had seemed almost incomprehensible to them as coming from so small a thing, but the noise of a diving aeroplane apparently frightened them as much as the sound of the big guns being fired.

We asked the District Commissioner what it was that had impressed them most out of all that they had seen. He beckoned over the two principal chiefs and spoke to them for a little while. They sat quite silent for a minute or two, apparently lost in thought. They then crossed over to the remainder and a most animated conversation went on amongst them to the accompaniment of much waving of hands and shaking of heads. We could not understand this at all, but from the amused smile on his face the District Commissioner must have had a very shrewd idea of the cause of it all. After some time the two chiefs returned, squatted down and started to ask us questions through the District Commissioner.

"How long did we stay at Khartoum without going to England?"

"Two years."

"Had we told them the truth about all the buildings on the camp?"

"Of course."

"Were there any other buildings that they had not seen?"

"No, they had seen them all."

“ Did we live and sleep all together in the camp ? ”

“ Yes, in our separate rooms or tents. Tents in the winter and rooms in the ‘ Blue Nile Mess ’ in the summer.”

Then followed some more conversation between the District Commissioner and the chiefs. He seemed highly amused at it all, and we were, naturally, extremely anxious to join in the joke. He made some statements to the Nuers which evidently impressed them, and they hardly seemed able to take their eyes off us right up to the time they left. This was what the District Commissioner said to us when he had finished talking to them :

“ You’ve shown them your aeroplanes, your bombs, and your guns, and you’ve frightened them very effectively. They’ve heard the big guns go off at the Fort and seen the arm drill of the troops. Now you ask them what impressed them most. They said they think it is very wonderful that you can live here for two years without any wives !”

THE FLEET AIR ARM: THE PROBLEM OF THE AIRCRAFT-CARRIER

BY CAPTAIN TAPRELL DORLING, D.S.O., R.N.
(TAFFRAIL.)

THE principal particulars of the British aircraft-carriers now in existence may conveniently be summarized in the form of a table. I have purposely omitted the *Argus*, now no longer in use as an aircraft-carrier; the seaplane-carrier *Ark Royal* which is not regarded as portion of the War Fleet but is used for experimental work with catapults; and the seaplane-carrier, *Albatross*, of the Royal Australian Navy.

	Date Laid Down.	Date Completed.	Displacement.	Speed.	Gun Armament.	AIRCRAFT NORMALLY CARRIED*			Total Available Capacity
						Fighters	Spotter Recon.	Torpedo Bombers	
<i>Courageous</i>	1915	1928	22,500	30.5	16 4.7"	9	18	12	52
<i>Glorious</i>	1915	1930	22,500	30.5	16 4.7"	18	18	18	54
<i>Furious</i>	1915	1925	22,450	31	10 5.5"	12	12	12	36
<i>Eagle</i>	1913	1924	22,600	24	9 6"	6	6	6	18
<i>Hermes</i>	1918	1924	10,850	25	6 5.5"	9	6	—	15

* SEE CURRENT NAVY LIST. Numbers and types of aircraft in the larger carriers are inclined to fluctuate.

The *Courageous*, *Glorious*, and *Furious*, were first completed as cruisers in 1917, while the *Eagle* was originally laid down as the battleship *Almirante Cochrane* for Chile, and the *Hermes* as a cruiser.

In addition to these regular aircraft-carriers a number of other ships are each equipped with one seaplane, and are already, or will be eventually, supplied with catapults for launching. Finality in design has not, however, yet been attained. The names of these vessels, together with the different types of aircraft in each carrier and other ships, can be found in the current Navy List. It is unnecessary to specify them here.

One interesting development in regard to the Fleet Air Arm, is the recent appointment of a Flag Officer to the *Courageous* in direct command of the aircraft-carriers of the Atlantic Fleet, and in charge of the tactical training and use of aircraft for naval duties. The officer selected was Rear-Admiral R. G. H. Henderson, C.B., who, through his previous service in command of the *Furious*, has probably more experience of the working conditions of the Air Arm at sea than any other serving Flag Officer.

As regards the aircraft-carriers of other Navies,* the United States possesses the *Lexington* and *Saratoga*, laid down as battle-cruisers in 1921 and 1920 and completed as carriers in 1927. They have a displacement of about 33,000 tons, a speed of between 33 and 34 knots, are armed with eight 8-inch guns, and are reputed to carry 120† aircraft. Hangar accommodation is said to be provided for forty-five aircraft only, the remainder being permanently accommodated on the flying deck or in crates. As arresting gear is fitted, aircraft can still be flown on and off with machines on deck. Another carrier the *Ranger*, of 13,800 tons, armed with eight 5-inch A.A. guns, is projected for the United States Navy. She is stated to be designed to carry 80 aircraft and 1,434 men, of whom 151 will be officers.‡

Japan has the *Kaga* and *Akagi*, originally laid down in 1920 as a battleship and a battle-cruiser, respectively, and completed as carriers in 1928 and 1927. They are each of 26,900 tons, have speeds of 23 and 28.5 knots, are each armed with ten 8-inch guns, and each carry 66 aircraft. The *Hosho*, completed in 1922, is a smaller vessel of 7,470 tons with a speed of 25 knots and four 5.5 inch guns, while the *Ryujo*, a vessel of similar size and speed, is still in course of construction. She is designed to carry twelve 5.1-inch guns.

France has only one aircraft-carrier, the ex-battleship *Béarn* of 22,146 tons, 21.5 knots speed completed in 1928, and armed with eight 6.1-inch guns.

It should be noted that the American *Ranger*, 13,800 tons, and the Japanese *Hosho* and *Ryujo*, both of about 7,500 tons, are the only aircraft-carriers in the Navies of the world specifically designed as such. This emphasizes the fact that huge carriers have definitely been found unsuitable, both from the point of view of their operation and their expense.

Here I must apologize for saying something of the limitations imposed by the Washington Treaty of 1922, and the London Naval Treaty of 1930, upon the individual size and armament of aircraft-carriers, upon the total tonnage in this class of vessel allowed to each of the Powers concerned, and upon the use of landing-on decks or platforms in other types of ships. Neither of these treaties has the merit of simplicity. They bristle with "exceptions" and "exemptions," and make excessively dull reading. Nevertheless, some mention of the various restrictions imposed is desirable.

* See an article on the Fleet Air Arms of the United States, Japan, France and Italy in "Brassey's Naval and Shipping Annual" for 1932.

† Estimates vary between 106 and 150. "Each has a complement of 106 planes and 1,934 men, of whom 158 are officers" ("The United States and Disarmament," by Benjamin H. Williams, p. 269). If the figures of personnel are correct, the *Lexington* and *Saratoga* have the largest complements of any man-of-war afloat.

‡ "The United States and Disarmament," by Benjamin H. Williams, p. 269. Whittlesey House. New York and London, 1931.

An aircraft-carrier is defined as "any surface vessel of war, whatever its displacement, designed for the specific and exclusive purpose of carrying aircraft, and so constructed that aircraft can be launched therefrom and landed thereon." The total carrier tonnage for the five signatory Powers is fixed at 135,000 tons standard displacement each for the British Empire and the United States; 81,000 tons for Japan, and 60,000 tons each for France and Italy.

No carrier of more than 27,000 tons may be built in the future, though, as the United States wished (in 1921) to retain as carriers the 33,000 ton *Lexington* and *Saratoga*, laid down as battle-cruisers, each of the other Powers may build not more than two 33,000 tonners as a *quid pro quo*, provided its total tonnage limit is not exceeded. No nation has yet taken advantage of this proviso, for the reason that carriers of this huge size are definitely too large and too costly to operate.

As regards armament, no carriers may mount guns larger than 8-inch, that is, the same sized weapons as those carried by the heavier cruisers. Carriers exceeding 27,000 tons—that is, the special 33,000 ton vessels alluded to above, must not carry more than eight guns larger than 6.1-inch. In other carriers, if the armament includes guns larger than 6.1-inch, the total number of guns mounted, excluding A.A. weapons and those smaller than 5-inch, must not exceed ten. If the armament comprises no guns larger than 6.1-inch, then their number is unlimited.

Other air clauses in the London Naval Treaty state that no carrier of 10,000 tons or less mounting guns heavier than 6.1-inch may be acquired by, or built for, any of the Powers concerned, nor may any such vessel be built within their jurisdiction. Moreover, the fitting of a landing-on or flying-off platform to any capital ship or cruiser not designed or adapted exclusively for use as a carrier, does not cause such capital ship or carrier to be classified as a carrier. By the next paragraph, however, no capital ship in existence on 1st April, 1930, may be fitted with a *landing-on* platform or deck. The British Empire, the United States, and Japan, also agreed that not more than 25 per cent. of their total tonnage in the cruiser category should be fitted with a *landing-on* platform or deck for aircraft.

It is worth noting that these rules for capital ships and cruisers apply only to *landing-on* facilities. There are no restrictions upon *flying-off* decks, catapults or other methods of launching aircraft, or upon the number of aircraft carried.

Naval surface vessels of 600 tons and less are exempted from limitation. Exempt, also, are naval surface combatant vessels of between 600 and 2,000 tons provided they do not mount a gun larger than a 6.1-inch; do not mount more than four guns larger than 3-inch,



[Photo : R.A.F. Official, Crown Copyright Reserved.]

VICKERS FOUR-ENGINE NIGHT BOMBER.
(Four Rolls-Royce "Kestrel" Engines.)

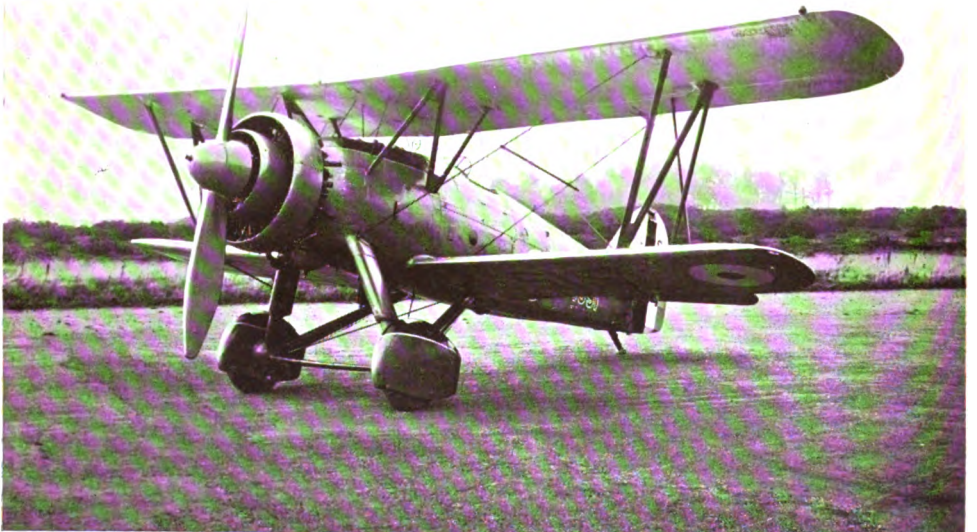


VICKERS TWO-ENGINE BOMBER.
(Two Rolls-Royce "Kestrel" Engines.)



[Photo : R.A.F. Official, Crown Copyright Reserved.]

**ARMSTRONG WHITWORTH "ARIES" ARMY CO-OPERATION TWO-SEATER EASY
MAINTENANCE. (Armstrong Siddeley "Jaguar" Engine.)**



[Photo : R.A.F. Official, Crown Copyright Reserved.]

**ARMSTRONG WHITWORTH SINGLE-SEATER FLEET FIGHTER.
(Armstrong Siddeley "Panther" Engine.)**

are not designed or fitted to launch torpedoes, or for a speed of more than 20 knots.

In effect, this means that vessels-of-war up to 2,000 tons and with speeds of less than 20 knots—sloops for example—may carry aircraft and launching apparatus without restriction.

Exempted from limitation are also "naval surface vessels not specifically built as fighting ships which are employed on fleet duties or as troop transports or in some other way than as fighting ships," provided their armament and speed conform to those mentioned above, and provided also that they are not protected by armour plate; are not designed or fitted to lay mines; are *not* fitted to receive aircraft from the air; do *not* mount more than one aircraft landing apparatus on the centre line, or two, one on each broadside. Moreover, if fitted with means of launching aircraft into the air, they must *not* be designed or adapted to operate at sea more than three aircraft.

In effect, this means that fleet auxiliaries must not be able to land on aircraft; but may have launching apparatus, one or two as the case may be, and be capable of operating three aircraft at sea.

THE QUESTION OF SIZE.

To be of utility to the Commander-in-Chief of a Fleet, aircraft must be available at any average moment. Those working from shore bases can join in any previously arranged naval operation within their reach, though their availability is governed more by the time they can remain in the air on reaching the scene of action, than by the distance they can fly. Whereas the endurance of a ship, however small, can be reckoned in days, that of an aeroplane, however large, must be reckoned in hours.

The distance at which aircraft can operate from the shore will naturally increase as time goes on. But at the present, if these aids to naval warfare are to be available to the Fleet at any time, more particularly in the wide ocean spaces, they must be carried thither in ships.

There are two main methods of doing this; first, by having special carriers of the type we now possess; second, by accommodating the number of aircraft necessary for Fleet purposes in the fighting vessels themselves.

If we observed the terms of the Washington and London Naval Treaties, but were unfettered by financial considerations, what sort of aircraft-carriers, if any, would we provide for the Fleet?

We could, if we so wished, build two such vessels of 33,000 tons mounting eight 8-inch guns like the *Lexington* and *Saratoga*, and others of 27,000 tons mounting ten 8-inch guns like the Japanese *Kaga* and *Akagi*. We might give these vessels speeds of 30 knots

or more like the two American carriers already mentioned, and our own *Courageous*, *Glorious*, and *Furious*. They might carry, let us assume, something like the 52 aircraft of the *Courageous* and *Glorious*, with a 50 per cent. reserve ashore but ready for immediate embarkation.

My own personal view, however, is that these huge carriers have only two advantages. First, the accommodation of all the aircraft of a Fleet in one or two hulls may be convenient from the point of view of administration, and for the purpose of co-ordinating the Fleet's air effort. Second, the larger the ship, the less likely she is to be affected by the weather, and the more likely she is to be able to fly off and land on her planes at any given moment.

These huge carriers, however, are very costly to build, to maintain, and to operate, and the *Lexington* and *Saratoga* are definitely regarded by their possessors as too large and too unwieldy.* Many British naval officers hold the same opinion about our own *Courageous*, *Glorious*, and *Furious*. These ships, being unarmoured, are intensely vulnerable, and if one of them were hit by a lucky shell, torpedo, or bomb, away might go 50 or 100 per cent. of the Fleet's aircraft at a single blow. Even if not vitally injured, damage which would not seriously inconvenience any ordinary vessel-of-war, might put an aircraft-carrier out of action so far as using her aircraft is concerned.

The number of aircraft which each carrier can operate successfully at sea is limited by the comparatively small endurance of the aircraft themselves. Even if they are flown off in relays, so to speak, their landing-on presents certain practical difficulties. It is as well to remember, too, that during the process of flying-off and landing-on, carriers must steam approximately head to wind at high speed.

At a critical stage of a fleet action, therefore, one can imagine conditions in which a huge, vulnerable, and costly aircraft-carrier will find herself parting company with her Fleet at a rate of 50 knots—no very pleasant prospect if the enemy is to windward. In such circum-

* The unit cost of warships in the United States is rising rapidly, and this is particularly so in the case of aircraft-carriers. At the time of their completion the *Lexington* and *Saratoga* had each cost about \$45,000,000, which was regarded as enormously expensive. With the dollar at par, this works out at about £9,375,000 per ship, or £284 a ton. The 13,800 ton aircraft-carrier *Ranger*, which in 1928 had been estimated to cost \$19,000,000, or about £3,958,000 at par, was included in the 1930 programme at \$27,650,000, about £5,760,000 at par, this latter figure including \$4,000,000, or £833,000, for aircraft. Excluding aircraft, the *Ranger* will therefore cost about £357 a ton.

A flying-deck cruiser of 10,000 tons was included in the 1930 programme at \$20,780,000 (£4,182,000 at par), \$1,180,000, or £247,000, being represented by the price of the aircraft carried. This works out at £395 a ton. Previous estimates for 10,000 ton cruisers without flying-decks had been about \$17,000,000, or £3,540,000, representing £354 a ton.

Compare these figures per ton with those of certain British ships. The battleship *Nelson*, completed in 1927, cost approximately £221 per ton complete; the cruiser *London*, completed in 1929, about £200; and the aircraft-carriers *Courageous* and *Glorious*, allowing for their conversion into carriers, about £173 and £189 a ton respectively. The German 10,000 ton "pocket battleship" is stated to have cost £400 a ton to build; but to save weight and to increase the speed and armament her hull was welded instead of riveted. This process is very expensive.

stances it is thus probable that an admiral would dispense altogether with assistance from the air when once the opposing Fleets were in touch, unless, of course, he were fighting under some disadvantage which his aircraft might possibly make good.

Even in tactical exercises carried out in peace the carriers are sometimes seen operating miles from their own Fleet, where, unprotected, poorly armed, and presenting a huge target, they are hardly a match for a single cruiser or a flotilla of destroyers. If the action is being fought in low visibility, their situation is more precarious still. One cannot imagine, for instance, what might not have happened to them if large British aircraft-carriers had been present at Jutland.

It is painfully obvious, therefore, that in certain circumstances these huge carriers, so far from being a help, may prove an added responsibility and an encumbrance to a naval Commander-in-Chief.

What of more moderate-sized carriers of the type of the British *Hermes*, the American *Ranger*, now under construction, and the Japanese *Hosho* and *Ryujo*, the latter of which is being built. Their principal characteristics are as follows :—

Ship.	Laid Down.	Completed.	Tons.	Speed.	Armament.	Aircraft.
<i>Hermes</i> ...	1918	1924	10,850	25	6 5·5"	15
<i>Ranger</i> ...	—	—	13,800	29	8 5"	80
<i>Hosho</i> ...	1919	1922	7,470	25	4 5·5"	28
<i>Ryujo</i> ...	1931	—	7,600	25	12 5·1"	24

These vessels are less costly to maintain and to operate than their larger sisters; but more of them would be required to accommodate the necessary number of aircraft required to work with a Fleet. They have the disadvantage, however, of being more influenced by the weather, which means that aircraft cannot be flown off or landed on with the same readiness as in larger ships, while they are undoubtedly poorly armed and would hardly be a match for a single cruiser or destroyer flotilla. Like the larger carriers, they have to steam practically head to wind to fly off and land on their aircraft, though, with a smaller number of aeroplanes to operate, less time is taken.

What other possibilities are there?

We might build aircraft-carrying cruisers, by which I mean regular cruisers provided with flying-off decks or catapults, and decks for landing-on. If we do so, however, we are limited to a size of 10,000 tons and an armament of eight 8-inch guns by the Washington Treaty.

But we already possess the full quota of fifteen heavy cruisers allowed us by Treaty, some of which carry a single seaplane or a catapult, and all of which may be expected to do so in the future. Even if it were possible, which seems doubtful, these ships could not be

provided with hangars and landing-on decks without great alteration and consequent heavy expense.

All the cruisers now being built are ships of 7,000 tons or less, armed with 6-inch guns. The *Leander*, the first of this type, will carry aircraft and a catapult, but will have no flying deck.

Here again, in trying to forecast, we stumble across another difficulty. In accordance with the Three-Power portion of the London Naval Treaty, the British Empire, the United States, and Japan have agreed that *not more than 25 per cent. of their total tonnage in the cruiser category shall be fitted with landing-on platforms or decks for aircraft.*

In other words, 339,000 tons being our total allowance in cruisers, not more than 85,700 tons can be provided with *landing-on* decks. This would mean twelve ships of 7,000 tons, fourteen of 6,000 tons, or sixteen of 5,000 tons. In my opinion, this restriction places us at a distinct disadvantage when we consider our extensive seaborne trade as compared with that of other nations.

I am inclined to think, however, that the use of vessels of this size as aircraft-carriers might be considerably curtailed by their motion in bad or moderate weather.

The use of *landing-on* decks in ordinary cruisers being restricted as described above, and no capital ships in existence on 1st April, 1930, being permitted to be so fitted by the terms of the London Naval Treaty, it has sometimes been suggested that heavy ships and cruisers, without *landing-on* decks, should carry more than the single seaplane and catapult now provided in certain cruisers. Any substantial increase, however, appears unlikely without a sacrifice of fighting efficiency in some other direction.

What of flying-boats of a smaller type, or floatplanes?

One naval writer, Captain Bernard Acworth, in his "Navies of To-day and To-morrow,"* to Chapter XIV of which, "The Future of the Naval Air Arm," I would draw attention, has suggested a more extended use of seaplanes. "Is it not essential," he asks, "that all machines employed regularly over the sea should be seaplanes?" And again—"Is there not a strong case in favour of making provision in our future battleships and cruisers for stout seaplanes carried at specially designed davits or stump derricks, and capable of being slipped in the old-fashioned way just as sea-boats can be slipped at a speed of ten knots?"

No doubt small flying-boats or float-planes *could* be so carried, though personally I see various objections to their use.

Both types can take off from, and land upon, the water in fine weather. In bad weather, however, they cannot be used. Recent experience with the float-planes carried in certain cruisers has shown

* Eyre & Spottiswoode, 8s. 6d.

that they cannot land with safety in a heavy swell or even a moderate breaking sea. Their landing speed being about 70 miles an hour, it may truly be said that they cannot alight upon the water in a sea in which the smallest of small boats could not ride in safety. During a cruise to the West Indies in the spring of 1931 there were very few days out of the thirty spent at sea when seaplanes could have landed on the water without coming to grief.

FUTURE DEVELOPMENT.

Bearing all these considerations in mind, on what lines may the Fleet Air Arm be likely to develop?

I pose neither as an air expert nor a prophet; but failing some radical change in the design of aircraft which permits them to alight upon a ship *without* a landing-on deck, I cannot think, as some people seem to imagine, that aircraft-carriers will vanish even from the World's Navies, at any rate, in those Navies whose task is oceanic and world-wide.

But I do foresee a reduction in the size of the regular aircraft-carriers to something considerably smaller than the great vessels now allowed us by Treaty, together, of course, with a reduction in the number of aircraft operated at a time by any one carrier. Moreover, I consider that there will be an extended use of aircraft and catapults in other ships, particularly in cruisers, and that a proportion of cruisers may have landing-on decks or platforms.

I see no possible diminution in the size or use of the Fleet Air Arm, which I consider a necessary adjunct to the work of a Fleet like our own designed to operate all the world over and at a distance from shore bases. But I consider that reconnaissance and artillery observation are the primary functions of our naval aircraft, and that torpedo-planes and bomb-droppers, though they will not vanish altogether for use at sea, are secondary to the spotter-reconnaissance aircraft. I fully realize that bombs and torpedoes may be of utility in certain exceptional cases during a fleet action, particularly against the enemy aircraft-carriers, damaged ships, and for surprise attacks upon Fleets in harbour.

Fighting aircraft will, of course, develop in speed and offensive power, but I should like to see the development of large flying-boats for use in close co-operation with the Fleet.

The Washington and the London Naval Treaties expire at the end of 1936. When they come up for extension or revision certain of their terms might well be simplified. As they are at present they seem greatly to hamper normal development and to stultify economy in design.

Battleships and cruisers definitely too large and too costly for our

present needs were brought into being by the Washington Treaty, while the same may be said for aircraft-carriers, of which each nation is permitted to build two vessels of 33,000 tons, and others of 27,000 tons.

At the London Naval Conference the numbers and total tonnage of cruisers allowed to the British Empire, the United States, and Japan were agreed to. France, however, maintained her demand for a very large "global," or total tonnage, coupled with a heavy building programme of light cruisers, destroyers, and submarines. Italy demanded parity with the strongest Continental Power, that is, France.*

But leaving France and Italy aside, would it not simplify matters and bring about economy if we could bring cruisers and aircraft-carriers together under the one heading of "Scouting Vessels," with simple, easily-understood limitations as to size and gun-power?

Personally, I think I would. By the London Naval Treaty we are allowed fifty cruisers of a total of 339,000 tons. By the Washington Treaty we are allowed 135,000 tons in aircraft-carriers, the total tonnage in these two classes thus being 574,000 tons.

I need not here belabour the point that fifty cruisers are inadequate to our needs in the event of war, and that under the "Safeguarding Clause" (Article 21, Part III) of the London Naval Treaty we hold ourselves free to increase the number and total tonnage of our cruisers, destroyers, and submarines if our "National security" is "materially affected by new construction of any Power other than those joined in Part III of this Treaty." In other words, if either France or Italy persist in large building programmes, we can follow suit.

But it would simplify matters if our aircraft-carriers and cruiser tonnage were lumped together under one heading, while formulating a rule that no future aircraft-carrier pure and simple should exceed, say, 15,000 tons, no future cruiser 7,000 tons, and that neither should carry guns larger than 6.1 inch. It is difficult to understand why, at the present moment, the number of guns of over 6.1 inches in calibre mounted in aircraft-carriers is specifically laid down, while nothing is said as to the *number* of guns in cruisers or heavy ships.

Suppose, for the sake of argument, the cruiser and aircraft-carrier tonnage were to be combined. We would have, say,

30 cruisers, each of 7,000 tons	210,000 tons
20 cruisers, each of 5,000 tons (One 5,000-ton cruiser is allowed for in the 1931 Naval Estimates)	100,000 tons
8 aircraft-carriers, each of, say, 15,000 tons ...	120,000 tons
Total	<u>430,000 tons</u>

* NOTE.—This article was written before the opening of the Geneva Disarmament Conference in February, 1932.

This represents a saving of 144,000 tons on the present combined permissible tonnage figure of 574,000, or a saving of 9,000 tons on the total tonnage of the cruisers and the five aircraft-carriers,* that we shall actually possess at the end of 1936 when the Washington and London Naval Treaties expire, if no new carriers are laid down in the interval.

The number of aircraft-carriers remains unspecified by Treaty, so if we wished to increase them we could do so by utilizing a portion of the 144,000-ton balance. The number of cruisers could *not* be increased without evoking the "Safeguarding Clause" already mentioned.

I need hardly add that all the fifty cruisers should carry aircraft in one form or another.

In conclusion, I would quote the final paragraph of an excellent article upon the Fleet Air Arm contained in "Brassey's Naval and Shipping Annual" for 1931 :—

"Beyond all, the Fleet Air Arm is that branch of the Navy and the Royal Air Force which, by virtue of the capacity of carriers and mobility of ship-borne aircraft, must be the spear-head of the Services in sea-board emergencies and operations; and upon whose activity, accuracy and aggression the success of the British Fleet in future battles may chiefly depend."

With this summing-up we can cordially agree.

* *Courageous*, *Glorious*, each of 22,500 tons ; *Hermes*, 10,850 tons ; *Eagle*, 22,600 tons ; *Furious*, 22,450 tons.

THE CO-OPERATION OF AIRCRAFT WITH A MECHANIZED ARMY

BY SQUADRON-LEADER R. L. STEVENSON, M.B.E., R.A.F.

ONE of the most interesting developments of modern times is that of mechanization in the Army. Recalling to mind the early writings of Major-General F. J. C. Fuller on the subject of mechanization, it will be realized that the picture he then gave of the Army of the future is in being to-day. The authorities have seen that the mechanically propelled vehicles will allow the soldier to fight behind armour and give him greater mobility in the field.

The Army Manual on Mechanized and Armoured Formations, 1929—now superseded by “Modern Formations, 1931”—will be of great interest to those who are engaged upon Army Co-operation duties in the Royal Air Force. The Manual shows how the mechanized formations will be organized, and lays down principles for the employment of the various arms.

The object of this paper is to give thought to the mechanized formations in battle, and consider how Army Co-operation aircraft may be employed to fulfil their reconnaissance needs.

History shows that air co-operation with mechanized vehicles started with the allotment of No. 8 Squadron, R.A.F., to work with the Tank Corps in June, 1918. The excellent pioneer work done by this squadron until the Armistice in reconnaissance and location of the enemy's anti-tank weapons is well known. Between 1918 and 1927 little more was accomplished than a few isolated experiments in inter-communication. During 1927 and 1928 the Mechanized Force was in being on Salisbury Plain, and much co-operation was carried out with the Experimental Brigade, which has been described in detail elsewhere.*

The scope of aircraft is bound by the tactical functions of the force with which they co-operate. In 1918, tanks were working in support of the normal formations. In 1927 and 1928 the Mechanized Force was experimental and its functions were therefore limited to an independent mission, *i.e.*, again in support of other arms. The Mechanized Army of the future will be capable of all the tactical functions of reconnaissance, covering fire, assault and exploitation of success. It is

* “Air Co-operation with a Mechanized Force”—Lecture to R.U.S.I. by Wing-Commander T. L. Leigh-Mallory, D.S.O., March 5th, 1930.

in this vast field of employment that the tactics of this force will have to be considered.

For those who have not followed recent development closely, there follows a brief description of the classification of the various types of vehicles, with suggestions as to how formations may be employed in battle, and finally an examination of some aspects of Air Co-operation with a force of this nature.

THE VEHICLES.

The vehicles are divided into three classes, viz. :—

- (1) *Armoured Fighting Vehicles*.—Medium and light tanks. These vehicles fight in movement and afford armoured protection for their crews. The medium tank has a maximum speed of 20 m.p.h., carries a small gun with an all-round field of fire, and several machine guns. The light tank has a speed of 30 m.p.h. and is armed with one .303-inch or .5-inch machine gun. Armoured cars and close support tanks also come within this category. The former type is well known. The latter type of vehicle is similar to the medium tank, and is still under experiment and not in general production. At present it is represented by the 18-pounder on S.P. mounting for close support artillery fire to the armoured fighting vehicles in action.
- (2) *Armoured Carriers*.—Machines which are designed to carry guns, or machine guns, and affording armoured protection for their crews. They are track vehicles with a cross-country performance, the weapons being dismounted from the vehicles for action. They are intended as first-line mechanized transport for the cavalry, infantry and artillery, and to carry their close support weapons.
- (3) *Unarmoured Carriers*.—Classified under this heading are all the normal vehicles for transporting infantry, equipment and supplies. Tractors for drawing guns are also included in this category.

Here it should be stated that mechanization in the Army has not yet been effected to the extent shown above. Although the British Army is ahead of all other armies in this respect, all vehicles and formations are experimental. The present state is that, in addition to the tank battalions and armoured-car regiments at home and abroad, heavy and medium brigades, and certain field artillery brigades, have been mechanized. All machine-gun companies, anti-tank weapons, and second-line transport have been mechanized, while the mechanization of all first-line transport is proceeding apace.

THE MECHANIZED FORMATIONS.

The Manual divides the fighting formations of the Army into two classes of troops: Mobile and Combat. The composition of the mobile troops will depend very much upon circumstances and the nature of the country in which the operation is to take place. They will, however, be organized in divisions, consisting of brigades of cavalry, armoured cars and light armoured brigades, infantry battalions in buses and close support tank batteries. Now, of the foregoing a light armoured brigade is the only formation that is not generally known; at present it consists of two or three light tank battalions and a close support tank battery. The foregoing description of the combat troops gives the impression of a force that can move fast and far and of being capable of hitting the enemy and possibly causing him serious delay.

The combat troops, on the other hand, are the heavier and less mobile formations. They will consist of infantry divisions, medium armoured brigades and other divisional and non-divisional units such as mechanized field and medium artillery. The medium armoured brigade at present has one medium tank battalion and two close support tank batteries. The combat troops, as will be seen, are organized to deal with the strongest opposition.

The Manual shows that the basis of the mobile troops is the light tank, while that of the combat troops is the medium tank.

THE MECHANIZED FORMATIONS IN BATTLE.

Consideration will now be given to the more difficult operations to a mechanized force, *i.e.*, the approach march, the deployment, and the encounter battle, in all of which operations accurate information from aircraft is of vital importance.

How will this mechanized army fight? It is most likely that the mobile troops will be used in the rôle of an advanced guard for the combat troops. The mobile troops, by virtue of their organization and mobility, would be able to gain touch with the enemy far ahead of the main columns. One day's march of such formations is at present 100 to 150 miles, while that of the combat troops might not be more than thirty miles. The commander of this force would instruct the O.C. Mobile Troops to get information of the enemy's location and disposition, indicating to him where it would be most suitable to meet the enemy in battle if he could be enticed to ground suitable for the successful employment of the combat troops.

While the enemy moves forward, the mobile troops would be employed to attack him in flank and rear wherever he was weakest.

Perhaps a good analogy to the action of the mobile troops is the battle-cruiser action. The main object of battle-cruisers is to penetrate

the enemy scout screen, gain contact with the enemy's battle-cruisers, and draw the enemy's fleet on to its own fleet. This analogy for the action of the mobile troops is probably truer than that of the advanced-guard action, since, owing to the mobility of armoured brigades and battle-cruisers, their initial contact will take place with the enemy at a greater distance from the main forces than would be the case in a normal advanced-guard action on land.

The mobile troops would not have to be exhausted too much during this phase of the operation. They will again be required for subsequent operations during the main attack.

Now consider the possible action of the combat troops after the mobile troops have completed their first duty of leading the main forces to deployment. The advance will slow up. The combat troops will be comparatively slower in moving in the presence of the enemy, because they will be very sensitive to ground and the enemy's defensive weapons. The tanks will be menaced by the anti-tank gun; while the advance of the infantry will be threatened by the enemy machine gun.

It is not within the scope of this paper to discuss the action of the various arms of the combat troops in detail. The following picture, however, is offered as a basis on which later to gauge the needs for air reconnaissance in such an action. The attack would be led by the light tanks of the medium brigades, supported by close support artillery fire to neutralize the enemy's machine guns and anti-tank guns. The light tanks would be closely followed by the medium tanks, which would endeavour to destroy the enemy by shock tactics. In the meantime, the field and medium artillery detailed for that duty would be carrying out counter-battery neutralization. The infantry would then go forward and hold the ground already gained while the tanks rallied preparatory to making another bound forward. When the force commander saw that he held and had possibly disorganized the enemy, he would bring in his reserve at the right moment. The reserve would be composed of the more mobile portion of the combat troops not already committed to the attack and would probably be used for delivering an attack in flank. In the meantime, the mobile troops will be delivering a carefully co-ordinated attack farther in rear. The pressure of these three attacks, if delivered with vigour, should be decisive.

AIRCRAFT.

How will aircraft help the mechanized formations in battle? A naval officer, writing recently on the work of the Fleet Air Arm with the Navy, said that there are three "Fs" in naval warfare—Finding, Fixing, and Fighting. He claimed that aircraft were responsible for

the first two duties, while the fleet carried out the third. If the analogy is applied to a mechanized battle, aircraft would be allotted the first duty, the mobile troops the second, while the combat troops would fulfil the rôle of the battle fleet. The Manual says that before the main body is committed to the attack it will be necessary to :

- (a) Obtain information regarding the movements of the enemy and carry out ground scouting. (In both of these aircraft will be essential.)
- (b) Locate the enemy's flanks and other details with regard to his disposition.
- (c) Hold the enemy when found.

With regard to the initial deployment, the Manual goes on to say that mistakes made then can rarely be rectified. The importance, therefore, of the information given by aircraft during the phase before the deployment cannot be overstressed.

The Army Co-operation Squadron as it is organized and equipped at present seems particularly capable of the work that will be required in an operation of this nature. The recent reduction of establishment in aircraft and personnel will allow it to keep pace more easily with a fast-moving force. The decision not to carry out major overhauls in the squadron and consequent reduction of stores should shorten the period of immobility necessary for maintenance. The aircraft has a radius of action of 200 miles. It is equipped with two-way W/T with a range of 200 miles for medium reconnaissance, and with two-way R/T for close reconnaissance with a present range of twelve to fifteen miles which, it is understood, will shortly be increased to a range greater than thirty miles. The efficiency of W/T as a means of communication is well known. The reliability of R/T equals that of any other means of communication if due care is exercised in its maintenance and operation.

Normally, the first information the force commander will receive will be from his distant reconnaissance carried out by day bombers. The primary rôle of these squadrons at this stage may be bombing to disorganize the concentration of the enemy or to assist in waging the war for air superiority. It is more than probable, however, that the force commander, attaching due importance to the necessity for early information, will give certain day bombing squadrons distant reconnaissance tasks as their primary rôle. Day bombing squadrons are trained and equipped for this work, but it should be borne in mind that the information will be more general than detailed, and will concern only the major movements on roads and railways which are discernible at the high altitude that it is necessary to carry out this type of reconnaissance.

Meanwhile, the forces will move towards each other and the Army Co-operation squadrons will be brought within range of the enemy. The force commander will undoubtedly seek the earliest opportunity for sending up these squadrons on medium reconnaissance, probably to a depth of 100 to 150 miles. More detailed information, of course, can be expected from this reconnaissance, as it is carried out at a lower altitude than the distant reconnaissance.

It has been shown that about this time the force commander will launch his mobile troops to gain early contact with the enemy, and obtain further information. The O.C. mobile troops, who is under orders of the force commander, will have his instructions to delay the enemy by delivering attacks upon certain columns. To this end he will require his own local close reconnaissance to give him more detailed information concerning that portion of the enemy that he is about to attack or reconnoitre. The information coming from the force commander's medium reconnaissance will not be sufficiently detailed for the O.C. mobile troops, and furthermore it is not operating under his own control.

At this stage there is, therefore, distant and medium reconnaissance being carried out for the combat troops and a local close reconnaissance working under command of the O.C. mobile troops. Each commander would have to keep the other informed concerning any important information that he had received and which he thought the other ought to know. This information would be sent by the normal means of communication on the ground.

The next phase is reached when the forces come within striking distance of each other. The advance of each slows up and the deployment starts. It will be essential for the force commander to send up his close reconnaissance before the initial deployment takes place. In moving warfare it is vital for the close-reconnaissance pilots to see the deployment because they have then the greatest chance of obtaining accurate and detailed information of the enemy's strength and disposition before movement has ceased and he has started to conceal his troops.

The enemy has now been found and fixed, and it will be necessary to attack him as quickly as possible.

In the meantime, information has been reaching the force commander from many sources. The medium reconnaissance has gone deeper over the enemy's rear columns. The mobile troops have attacked and have discovered much concerning the enemy's movements in rear; while close reconnaissance is operating on the immediate front.

The force commander has made his plan of attack. The combat troops have deployed for action. The medium armoured brigades are within striking distance of the enemy. The infantry has been moved

up as close as possible and debussed, while the close support and heavier artillery are in position. The stage is now set for the encounter battle. Let us consider how aircraft may be employed at this juncture.

It may not be necessary to continue the medium reconnaissance. It is a question of time and space, and detailed information of the enemy's movements fifty miles behind the front may not be required at this stage. The distant reconnaissance maintained by the day bombing squadrons may be sufficient for this and allow the medium reconnaissance to be withdrawn and the aircraft allocated to the more important duty of close reconnaissance for the attack. We have seen how the main attack will most probably take the form of a series of bounds led by the light tanks to neutralize the machine gun and anti-tank weapons; followed by the medium brigades which will break down the resistance of the enemy, and finally the employment of the infantry in clearing up and holding the ground. In an attack of this nature the close reconnaissance aircraft may be ordered to confine his attentions to reporting the progress of the attack. The bounds will have to be very carefully controlled by the force commander so that each assault is not too far spent.

Communication between the force commander and his brigade or divisional commanders will be difficult and it may well be that he will have to rely upon his close reconnaissance aircraft for information. Lateral communication may also be difficult and there will certainly not be the complete system of line telephony that is possible in static warfare. If, therefore, the pilot can give a comprehensive and accurate picture of the progress of the attack at the time that it has taken effect it will be of the greatest assistance to the force commander.

Working above the close reconnaissance and slightly farther into the enemy's lines will be the artillery reconnaissance aircraft. Targets will be selected by the artillery pilots and sent down to the field and medium artillery which have been detailed to neutralize the enemy artillery. It is doubtful whether it will be advisable for the artillery reconnaissance pilot to concern himself with targets any nearer the front line. The attack will be fluid and it is probable that a great deal of smoke will be used to mask the fire of anti-tank weapons; thus it may be dangerous for the pilot to select targets in advance of the enemy artillery. The neutralization of the enemy artillery by observation from the air will, however, be a very important duty because, owing to the speed with which the attack has been launched, it is unlikely that there will be time to organize an adequate system of observation posts.

At this stage the force commander will consider how and when to launch his final blow—the reserve. To aid him in this decision the

close reconnaissance pilot will have to establish the enemy's flanks and generally give information which will prepare the way for the movement of the reserve to its objective. The operation of this part of the force will naturally be all-important, as, in combination with the other attacks, it should have a far-reaching effect. It will be the duty of aircraft to watch, aid, and report upon the progress of this attack. Meanwhile, the mobile troops will have been ordered to deliver an attack farther in flank and rear, and to this end will still be employing their own local close reconnaissance. The three attacks described above are the culmination of the approach march, the deployment, and the encounter battle.

NIGHT RECONNAISSANCE.

It is felt that some distinction has been drawn between the mobile warfare of mechanized formations and the more static type of warfare which was characterized by the war 1914-1918. Thus the end has been achieved in providing a basis, a picture on which to examine the co-operation of aircraft. No attempt, therefore, will be made to consider the operations of defence, pursuit, etc. In so far as aircraft are concerned, however, there remains yet one very important rôle to consider—night reconnaissance.

It will be understood that the various phases of the approach march, deployment, and encounter battle, as depicted above, may extend over many days. Owing to the ubiquity of aircraft during the day, it is more than probable that the enemy will be compelled to carry out much of his movement under cover of darkness. Night reconnaissance is therefore likely to assume greater importance. At present, training is progressing. All Army Co-operation pilots are trained to fly their aircraft by night and are equipped with a suitable aircraft for night flying.

What will the pilot see of mechanized formations moving by night? It has already been established that vehicles must use lights in order to move by night, but it is an easy matter to screen these from the air and, in fact, this has already been done. Movement will, where possible, take place on roads so that ground reconnaissance may not be necessary. The pilot's problem for the future will be very much the same as it was in the past. Experience in night reconnaissance shows that no really satisfactory result can be achieved without the intelligent use of a high-powered flare.

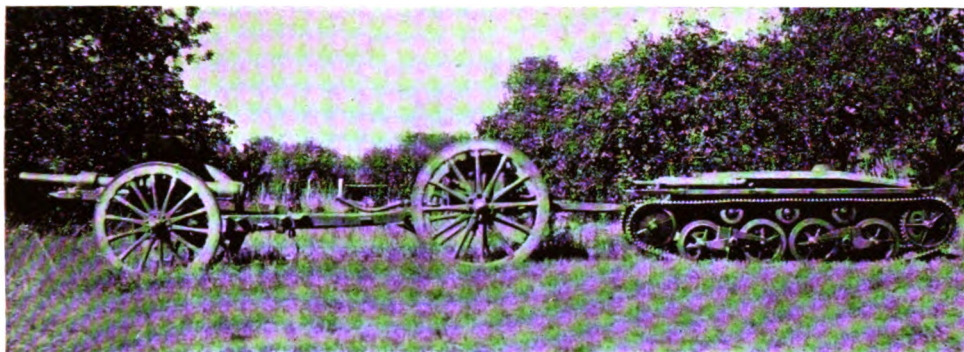
Such flares are in existence, although their general use in peace is very much curtailed by the risk involved to personnel and material on the ground should they fail to ignite or burn after alighting. Experience and practice in the dropping of these flares are necessary if the pilot is to use them effectively in war.

It must be borne in mind that Army Co-operation squadrons cannot work both by day and by night. It will be necessary for certain squadrons to be reserved for night work alone during phases of the operation when night reconnaissance is necessary, or to have Army Co-operation squadrons specially trained and earmarked for these duties.

CONCLUSIONS.

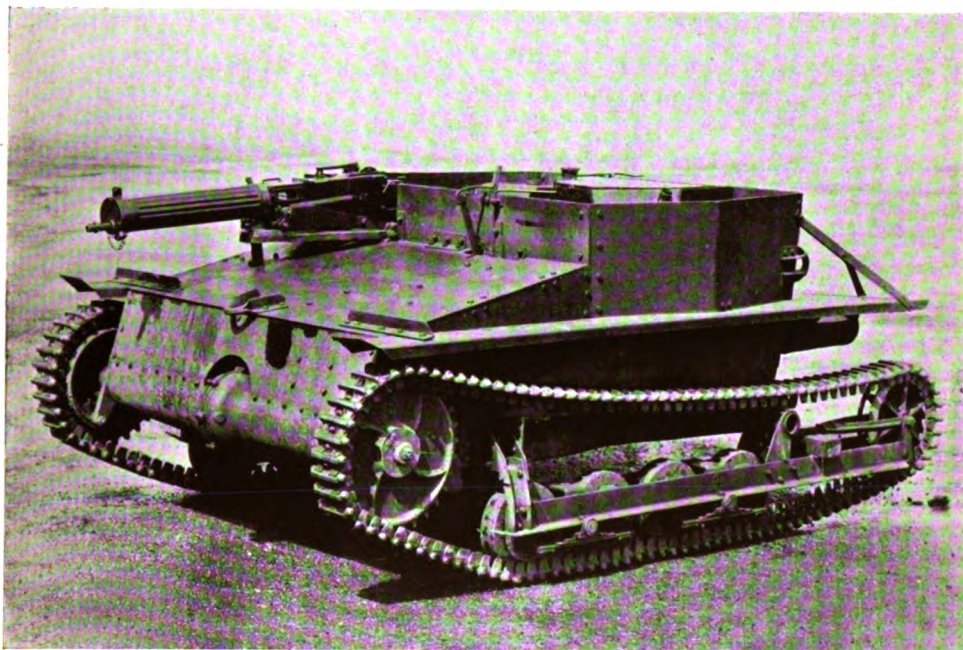
The Manual on Mechanized and Armoured Formations states: "A hostile commander will be embarrassed by the fact that any point within 100 miles of an armoured formation is liable to attack by it." If this is so to-day, what will future developments bring forth? An effort has been made to show how the mechanized formations in battle will be increasingly dependent upon reliable information from the air. This will be essential if a commander is to formulate his plan of attack while the enemy is yet 100 miles distant, and aircraft will be the principal reconnaissance arm by which he may expect to obtain this information.

It has also been shown how reconnaissance aircraft may have to give a commander continuous information concerning the disposition and progress of his own troops owing to their wide sphere of movement and the difficulty of information and communications. Artillery reconnaissance will not be so frequently demanded as it was in position warfare, but it will be of vital importance for neutralization. A force such as the mobile troops will require, at least, its own local close reconnaissance, which should not be confused with the medium and close reconnaissance that the force commander may require at the same time for the Combat Troops. In all probability night reconnaissance will be a more urgent necessity than in the past. Up-to-date and detailed information from 100 miles away is the factor which will allow mechanized formations to retain that attribute which is their greatest asset—mobility.



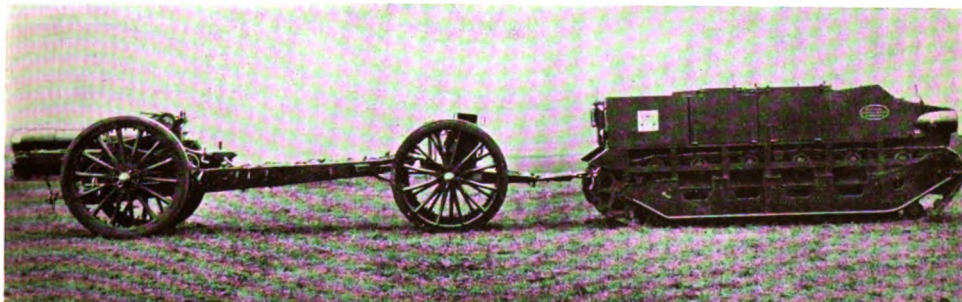
DRAGON LIGHT MK. I (EXPERIMENTAL).

The Dragon can only be taken as showing generally the *type* of vehicle. It is unarmoured and has a speed of 20 m.p.h.



CARDEN LOYD MK. VI. MACHINE GUN CARRIER.

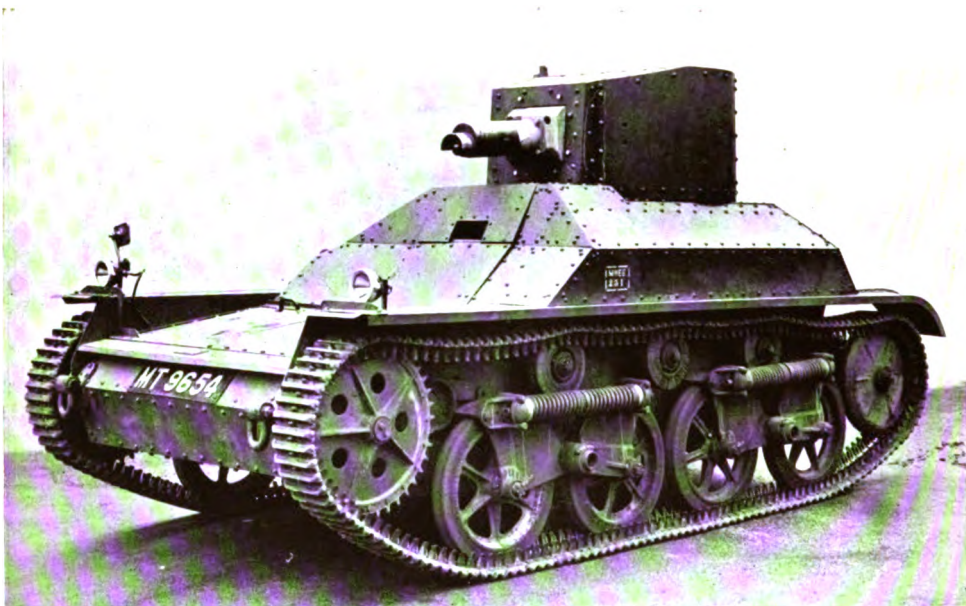
Armament, one '303 Vickers M.G. Its speed is about 12 m.p.h.



DRAGON MK. IILB., TOWING A SIX-INCH HOWITZER AND LIMBER.

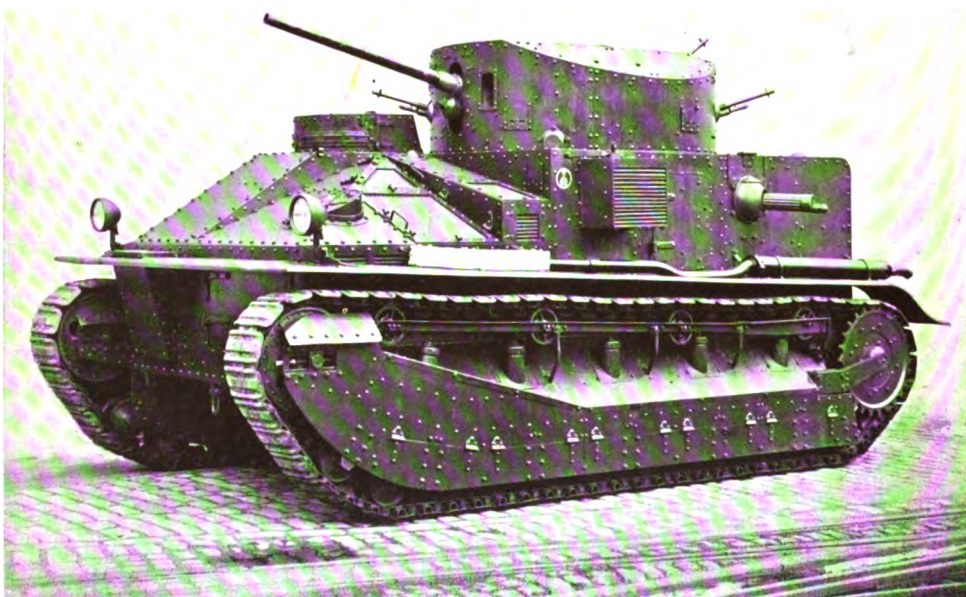
It has light armour and a speed of 10 m.p.h.

[Photos : War Dept.]



LIGHT TANK MK. IA.

Armament consists of one .303 Vickers M.G. Its speed is about 22 m.p.h.



MEDIUM TANK MK. II.

Armament, one 3-Pounder, two .303 Vickers M.G., and three Hotchkiss Light Automatics. Speed about 10-15 m.p.h.

[Photos : War Dept.]

COMPULSORY PILOTING

By "SEAGULL."

AN article headed "Compulsory Piloting," appeared in the *Aeroplane*, dated August 26th, 1931. The author of this article questioned the soundness of the regulation under which officers of the General Duties* branch up to and including the rank of Wing Commander must carry out a minimum number of flying hours during each year.

The whole question of General Duties officers retaining their ability to fly whilst employed on non-flying duties is of such paramount importance to the Royal Air Force that it is proposed to examine here the reasons which have rendered it necessary to enforce a policy of minimum flying hours, and also to show how the regulation which enforces this policy is working in the Service to-day.

It may be said at once that few questions are more discussed in the Royal Air Force. Opinions vary considerably, mainly, it is suggested, because the necessity for the regulation is not properly understood.

The author of the article quoted above has evidently been misinformed on a number of points. For instance, it is stated that certain pilots have been deprived of their flying badge (Wings) because they had ceased to fly. The present writer is not aware of a single case in which this has happened.

Further, it is the policy of all the three Services that an officer should not remain continuously employed in a Staff appointment, but that he should alternate between General Duty and Staff work.

This policy is not followed by some foreign countries who employ certain officers in staff or specialist duties only. It is not proposed to discuss this policy here; the advantages of a Staff Officer, however highly qualified, returning from time to time to active flying duties, and thereby retaining a broad outlook on general Service matters, would appear to be considerable; the fact remains that a Staff Officer or an officer employed on specialist or administrative duties does return to flying duties after two, three or four years. This being so, it is of course necessary that he should retain his ability to fly, at least until he reaches the rank of Wing Commander, as he may at any time be called upon to command a Squadron.†

A third point, brought up by the author, is that airman pilots are

* R.A.F. officers are divided into various branches—i.e., General Duties, Stores, Medical, Accountant, Chaplains. General Duties branch officers are nearly all qualified pilots.

† A twin-engined Bomber Squadron is commanded by a Wing Commander.

rapidly replacing officer pilots, and that as pilots in future will act as chauffeurs, it will be unnecessary for Commanding Officers to fly as pilots. At present, the policy is that Commanding Officers lead their squadrons in the air. As long as this policy stands, and may it long do so, the question of airmen pilots does not arise.

The cost of training a pilot is considerable, amounting to hundreds, and in many cases, to thousands of pounds. Until a pilot has been flying for a period of two or three years, he can hardly be considered as fully qualified. During this period, a large proportion of officers damage or write-off at least one aircraft. It has sometimes been suggested that until a pilot has crashed once, he is not an experienced pilot. At any rate, crashes considerably increase the cost of producing a fully-trained pilot.

Experience has proved that a pilot who ceases flying for a period of years, or in some cases even for a period of months, often loses the desire to fly as well as his ability to control an aircraft. This is especially so after the age of 30. More often than not, it has nothing to do with his previous liking for flying, or his keenness to take it up again. The writer has had personal experience of this phenomenon. Himself a keen pilot, he competed successfully, over a number of years, in the race for flying hours with other pilots who were equally keen. He was employed temporarily during seven months at a station which was two hundred miles from the nearest squadron. At the end of this time he started flying again. There was a distinct feeling, after making a landing, of being glad to be safely on the ground, that one might as well stay on the ground and stop flying, anyhow, for that day. This feeling is cumulative and increases rapidly. It is not generally realized how large a number of trained pilots have given up flying altogether during the past ten years, mainly, it is suggested, because they did not keep in flying practice. For one reason or another, they have been employed on non-flying duties for a period of years, and they have lost both the ability to fly and any desire to do so again. In most cases, they are too old to wish to start afresh. A man over 35 seldom likes that "first solo" feeling, which gives such a thrill to the younger man. Being of a certain age, he is perhaps more honest with himself; he realizes that he is frightened and does not like it; it is undignified and unmanly.

Let us see now who are the delinquents against whom this terrible regulation is aimed. The writer has had the opportunity of studying the position at close quarters, and has noticed that it was not the Staff officers nor the senior officers who, in most cases, had difficulty in obeying the regulations. These officers usually welcome the opportunity of leaving their offices, abandoning with pleasure many urgent or pending files; they are glad of an excuse which will allow them

to steal a breath of fresh air. Strangely enough, it is the officer who is employed on ground duties at an Air Force aerodrome where aircraft are available, who has failed in the past to carry out the required amount of flying; I refer to specialist and to administrative officers. Why is this? Because in order to fly, these officers must borrow an aircraft from an unwilling Flight Commander, whose normal training programme is therefore interrupted and interfered with. It is easier to draw blood from a stone than to obtain the loan of an aircraft from a busy Flight Commander. This difficulty has in many cases been solved by the establishment of station flights for the use of officers, whose duties keep them on the ground. Where these flights do not exist, the pressure of a King's Regulation is necessary before it becomes possible for a ground duties officer to obtain facilities to fly. Note that the word "facile" means "easy." The ground officer is often a very busy man, and it is unfair that he should be obliged to beg for an aircraft whenever he has the time to spare for flying.

It is seldom realized how large is the number of General Duties officers employed on ground duties to-day. On many stations there are over a dozen so employed. The suggestion that these officers should be given a refresher course before they return to flying duties is impracticable. The Central Flying School, No. 24 Squadron, and one or two other units, where refresher courses are given, are fully occupied with pilots who have been kept off flying through unavoidable causes, such as sickness, or because they have been employed as Air Attachés, as Intelligence Officers in Iraq, or because they have been loaned to foreign countries. There is always a long waiting-list, and in many cases, these courses take several weeks.

There appears, therefore, no other solution to the problem but to insist on pilots always keeping in flying practice, and to lay down a minimum number of hours to be flown by all pilots every year. There are always special cases in which an exception should be made, but it must be remembered that, human nature being what it is, it often appears to the individual that there are special reasons why he personally should be exempted.

It is not denied that there are difficulties involved in complying with the order, and that considerable hardships are inflicted in some individual cases, but it has been proved that if enough pressure from above is applied, the great majority of officers can and will fly the required number of hours each year, and that the Service and the country profit thereby.

The position of officers at the Air Ministry is somewhat different. There are approximately fifty officers of the General Duties branch of the rank of Wing Commander and below, who are employed at the

Air Ministry, and whose normal tour of duty there is three years. According to the regulations, these officers must complete six hours' flying during the year. This is not an easy matter, as it entails travelling out to Hendon or Northolt, and a whole morning is easily spent in completing one hour's flying. It should be noted, however, that one flight to Catterick and back, with a halt at one of the many stations *en route* would represent five out of the total of six hours required for the whole year. A number of officers at the Air Ministry can find good reasons connected with their work for visiting an Air Force Station. A good many officers from the Air Ministry do, in fact, visit stations by air, and in this way save time. A director of one of the departments at the Air Ministry recently visited twelve stations in three days. By road these visits would have taken at least ten days. The problem of refreshing all these officers either at the end of their three years' tour of duty or annually, could not be solved without considerably increasing our training establishments.

The following suggestions are, however, made to assist and encourage officers employed on ground and staff duties to complete the required amount of flying.

It will be agreed by most pilots that flying round an aerodrome and practising landings, or even flying to another aerodrome, when there is no particular reason for going there, is extremely boring. One feels one is wasting one's time, and that the whole thing is rather pointless. If officers were allowed and encouraged to use service aircraft during week-ends, in fact to combine business with pleasure, the majority of them would find no difficulty in complying with regulations. It is suggested that this type of flying is of more value than "putting in time" by flying round the same aerodrome and being thoroughly bored. It would also encourage pilots to get away from their home stations. Flying during the week-end, however, is not encouraged in the Service for several practical reasons. It is felt that, in peace-time, airmen should, as far as possible, have their week-ends undisturbed. Wireless communication between stations closes down from mid-day Saturday to Monday morning. Any considerable amount of flying during the week-end would entail filling up aircraft, and occasionally collecting or assisting an aircraft which had forced landed. As duty flights are always on duty, as well as duty pilots and orderly officers, these difficulties would not appear to be insurmountable. The writer's experience has been that duty flights, even on Sundays, welcome a stranger; anything to break the monotony of being confined to camp. Telephone communication is quickly obtained on Sundays.

The other suggestion for encouraging pilots to fly is more radical, and might be criticized from a financial point of view.

When Staff officers visit units, they often travel in their private cars and claim a travelling allowance of twopence a mile. It is thought that pressure should be applied to make Staff officers travel more frequently by air. It can, of course, be argued that when Staff officers announce a visit on a certain date they should arrive on time and that, with our bad climate, this is rarely possible if air travel is used. This is true to a certain degree, but not to such an extent as might be thought. It is suggested that a small air mileage allowance (possibly half the road allowance), might be made, in certain bona fide cases, to Staff officers travelling by air. The resultant increase in flying hours carried out by these Staff officers would be surprising. The Treasury would gain in hard cash because these same Staff officers would cease flying round their aerodromes to put in flying time, thus wasting valuable hours which they might spend at their desks. Their travelling time on visits would be halved, claims for detention allowance and for hotel bills would in many cases not occur as the visit would be completed in one day instead of in two days and a night, and travelling claims would be halved. Safeguards would, of course, be necessary to ensure that air travelling allowances were not claimed for "joy-ride" visits but only for those officially sanctioned. These safeguards already exist for ordinary travelling claims.

To sum up :—

1. All officers of the General Duties branch up to and including the rank of Wing Commander must keep in flying practice as long as it is the policy :

- (a) for Commanding Officers of squadrons to lead their squadrons from the pilot's seat,

- (b) for officers to hold ground and flying appointments alternately.

2. It is not possible with our present training establishments to give refresher courses to all officers who have been employed on staff and ground duties for anything up to three or four years. In any case it would be expensive and if such a policy were adopted it is probable that many officers would not fly again after their tour of ground duty.

3. The regulation which insists on a minimum number of flying hours being completed by every pilot can be and should be enforced. Although it may inflict hardship in individual cases, the regulation is necessary and can be obeyed.

4. Every effort should, however, be made to give officers the necessary opportunities and facilities to fly. Officers employed on ground duties should be allowed and encouraged to fly during week-ends and Staff officers should travel more often by air. In this connection an air mileage allowance would help.

PSYCHOLOGY

BY SQUADRON-LEADER A. ROWAN.

II.—PSYCHOLOGICAL ELEMENTS IN MAN.

“ *Fiat justitia, ruat cælum.* ”

“ *Tout savoir, c'est tout pardonner.* ”

IN the first of these papers stress was laid on the importance of the sentiments, and an understanding of them. Heredity was also referred to. As the object of this paper is to get some idea as to what constitutes “ good ” psychology and “ bad ” psychology in daily life, we must begin by examining the elements of the psychological entity. Such confusion of thought exists in the average man on the meaning of quite ordinary words used in psychology that, if asked to explain the difference between temperament, sentiment, and emotion, he would find it very difficult to do so. Yet it is essential that the difference should be clearly understood.

We come into the world possessing instincts, and already certain innate tendencies, which must not be confused with hereditary or ancestral characteristics. For example, we enter the world with an innate tendency towards *sympathy*, which means “ a suffering with,” and includes the ideas of suggestion and imitation. If two dogs growl it is common experience that the dogs within sound or sight promptly stiffen, and show symptoms of annoyance. We hear a bugle blow and all promptly down tools because it is the “ Cookhouse Door ”! A child will start crying in sympathy with its mother! Now, the child has not had time to acquire sympathy—good evidence for the statement originally made. We may, however, include the element of imitation in sympathy. To a certain extent the child cries in imitation of someone else crying.

Another *innate tendency* is *play*. Children play spontaneously and without any teaching. In this tendency we may trace Nature's method of getting rid of superfluous energy which at the same time teaches us, and fits us for, rapid and intricate movement in later life.

Either of these tendencies may become more developed in one man than in another and will persist all through life. They are likely to make him more suited for a certain position in life than a man in whom they are lacking. How one may recognize these and other traits in a man will be explained later.

Of all the native mental constitutions, however, the vital one is *temperament*. It is important in daily life, because, although its

influence may be slight at any one time, yet its effect is cumulative. What is still more important, it is closely allied to our physical condition. "Mens sana, in corpore sano" is the keystone in the structure of a healthy entity. When we say "Fear God and honour the King," we should also add, "and keep your bowels open." An unhealthy body tends towards an unhealthy outlook on life, and it is "temperament" which determines our general outlook. For this reason healthy exercise *during childhood* is of such importance. It develops an active muscular system which tends to maintain a healthy tone throughout the nervous system, and which favours an alert and confident habit of mind.

One of the most startling examples of the influence exerted by certain organs on mental life is the thyroid body, a small mass of cellular tissue in the neck. If its function is defective we get an extremely lethargic individual. Its excessive activity produces a highly excitable condition. So also with phthisis, which gives a bright and hopeful turn to temperament, whereas diabetes gives it a dissatisfied turn.

I think that one of the great lessons to be learnt from what has been said is that we must be very cautious about jumping to conclusions which are likely to condemn a man unjustly. We are all very inclined to judge by hearsay, and sometimes real hardship is imposed. It is only when we ourselves are convinced in our own minds by personal knowledge of the case that we are in a position to pass any sort of judgment. It is bad psychology in connection with ourselves. *If we come to a conclusion lightly once, it becomes easier to do it a second time, and so it may become a habit.*

One of the events which impressed itself most deeply on my mind years ago in India was the incident relating to an Assistant Police Superintendent. He had only just arrived from England and steadily refused either to have a drink at the club or to stand one. He kept very much to himself and rapidly gained a reputation for meanness and stinginess. It is no offence not to drink whisky, but the club could not forgive him for never standing one. There is no question that, owing to his temperament, he felt the attitude of the club keenly. After a time he was transferred to a lonely sub-division, became ill, and—committed suicide. Now, while everyone had been judging him, without a soul taking the trouble even to advise him, or to gain his confidence, he had been a hero. His widow mother had scraped and starved to get him into the police, and had ultimately borrowed the money to buy his uniform for him, and he was saving every anna to repay her.

We must not judge by appearances—we must know what went before.

As regards temperament, I think we can say that its peculiarities

in the individual give a constant bias to the selective activity of the mind and give it a certain trend. It determines to some extent our cast of thought and therefore the broad lines of action.

This point, then, is well worth noting and remembering. We must, in coming to conclusions regarding a person, take his temperament into consideration, and must remember that it was his from the start and is not a thing for which he can be blamed and which he can alter at will.

From this point we can go on to consider

THE SENTIMENTS

and their vital importance in our everyday life. "Sentiment" and "emotion" are constantly confused. They are not interchangeable words. An organized system of emotional tendencies, which *centre round* an object, is what a "sentiment" really means. The two great sentiments are love and hate. Now it is clear that love and hate are not emotions, because one can do either, although the individual concerned is not present, either in the body or in thought, and while one is not experiencing any emotion at all. The point of vital importance to bear in mind is that *we acquire sentiment, and we do so in our childhood*, through the experiences which we encounter in our homes and in the nursery. A child is like a ball of plasticine, ready to record anything impressed on it. During those vital days it has nothing in the world on which to build up its entity except the immediate little experiences which go on around it. If, therefore, the atmosphere in which it is brought up is one of love and understanding, and the child's experiences record themselves as a pleasant memory, a love sentiment is being inculcated in it. *It is upon the acquired sentiment* of "love" or "hate" that the young man, leaving home, will build his character. When *his* young life's experiences come along he will *interpret them* in his mind along the lines of his acquired sentiment. In consequence, he is growing up in character according to the predominating sentiment.

For instance, to take a pronounced example which nevertheless occurs in instances of thwarted love or loss. A child is dying. This child is the only one, and the idol of a worldly mother's heart. Driven to an extremity, she finally and for once in her life prays to the God whom she has consistently ignored. The child dies. As shown in the previous article, the mind has got to deal—and does so—with this new experience. Through the processes of knowing, feeling and striving the mind is going to find a meaning for this perception; yes, along the lines of the predominating sentiment. We may therefore expect two contrary reactions.

One: "There is no God. If there was, He would have let my child

live. If God is love, He could not be so cruel as to take my only child from me. I shall never believe in God any more." The character speaking here is one created on a sentiment of "hate," steadily hardened through the continued interpretation of experiences along the lines of that sentiment. For the law of habit cannot be ignored, *i.e., the tendency for every process to be repeated more readily in virtue of its previous occurrence, and in proportion to the frequency of its previous repetitions.*

Two: "I do not know why this is happening to me. I feel a deep sorrow. My faith in God, however, is such that I shall continue to believe that He has a sufficient reason for this. His will be done." Here speaks one whose previous experiences have been interpreted on the sentiment of "love," a person whose sentiment has become consolidated and confirmed by habitual action in accordance with its promptings. Now, this process is going on continuously in our minds with every experience that comes along, and the interpretation of the experience is put away, to build up a little more of ourselves—the "ego," that part of me which constitutes my own entity.

We must be careful to note, however, that the sentiments of love and hate include many of the same emotional dispositions. A man who has acquired the love sentiment is apt to experience *tender emotion* in the presence of the person or object, *anxiety* when it is in danger, *anger* when threatened, *sorrow* when it is lost, *joy* when it prospers, *gratitude* towards the one who does good to it, and so on. With a hate sentiment, *anger* will be experienced on the approach of the person or object, *joy* when he is injured, and *anger* if he receives favours.

OUTWARD SIGNS.

What has been said may be summarized as follows—before we go on to the practical aspect of the judging of a person's actions, character and value. We come into the world with instincts, inherited characteristics, and innate tendencies. These tendencies are stronger in some than in others, so that a man with innate sympathy is more likely to develop along the lines of the love sentiment than one in whom the tendency is lacking. Our sentiments are acquired, but our characters we build for ourselves, according to the law of habitual action. The sentiments acquired in youth are therefore of extreme importance.

How can one get a practical idea of the category to which a man belongs? Are there any outward and visible signs of the inward and spiritual processes? The answer is—yes. We all, from childhood, display emotions, and every emotion has its characteristic conjunction of motor tendencies, which give rise to the characteristic attitudes and *expressions* of the emotion. It is a very simple matter to realize how true this is, by considering how very successfully a really good actor

can imitate even complex emotions. The experiencing of emotions time and again begins to leave a record in the human face, and it is by the head and the face of a man that we can arrive at a reasonably accurate estimate of his "character"—a subject to be discussed later. We are all familiar with the saying, "What the heart is full of, the mouth speaketh of." Very true in general, but there are several exceptions, as, for example, a political agent. I think, however, that if we were to say "What the soul thinks of, the face records" we should be very near the truth.

Let us take a few important examples. Two totally different sets of lines are produced on the forehead by worry, and by thought. The man who is constantly wondering and worrying, develops horizontal lines across his forehead. The man devoted to constant thought develops vertical lines of increasing depth. This small item alone is valuable in our summing up of a man. A jovial nature is constantly laughing, and the characteristic lines round the eyes and lips are there to assist our diagnosis. The eyes, so very important, have been described as "the windows of the soul." The big round eyes, looking out in wonder on the world, hall-mark of a trusting romantic and/or a fearless nature. The veiled eye in which the eyelids cross the pupil. This is the eye of control and caution, and distrustfulness, very often the result of wrong handling in childhood. It would be possible to go on taking the primary emotions, and write a small book on their influence on the human face. At the same time one cannot attempt the judging of a man's character by his face alone, nor without years of practice and study of the face and head. *Never jump to a conclusion on one characteristic only.* A man may have a fine square jaw which, quite erroneously, most men associate with a strong will. It usually indicates decision, strong passions and stubbornness, by the constant closing of the jaws in thought. We must know first, however, that it is not due to a physical cause—unremoved adenoids! Dark rings round the eyes, so often taken as a hall-mark of vice, are far more often due to an unhealthy stomach condition than vicious habits. In considering the value of a man's chin we must examine the predominating constituent; is it fat, muscle or bone? The chin as part of the jaw is important. In illustrations, we have become accustomed to recognizing a clerical chin, the doctor's chin, the actor's chin, and the soldier's chin. It is impossible, however, to continue with these characteristics. The important point to remember is, that the workings of the mind and soul impress themselves on the face through the law of habitual action, and a study of the subject, with constant practical experience, gives us an insight into the nature with which we are dealing.

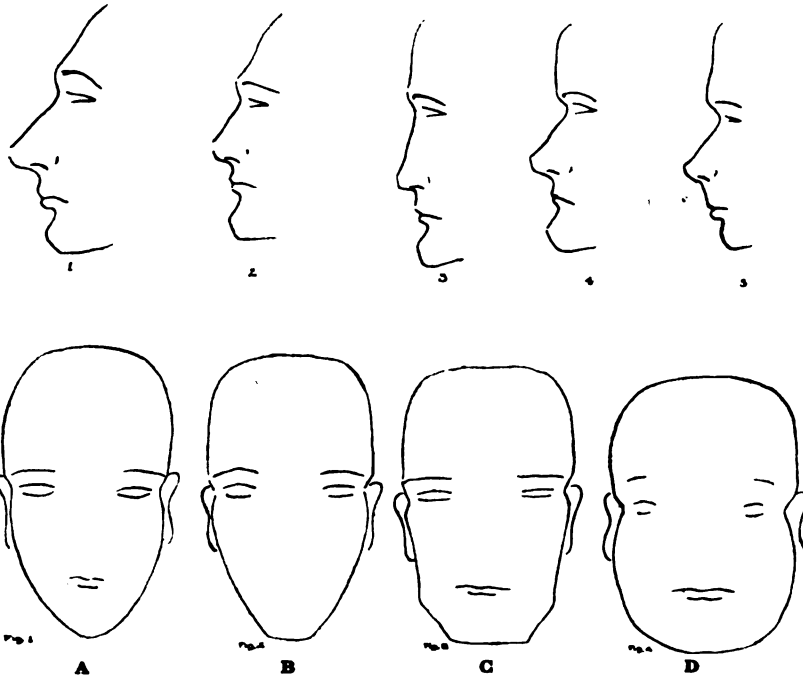
Even if our knowledge is very limited, as long as it is sound we

shall avoid serious errors of judgment. One of the great reasons why this knowledge is so useful in the Services is that it helps us to treat an individual according to his personal needs *in order to get the best out of him*. Even if through posting, a square peg has to be fitted into a round hole for three years, yet he can be made valuable, through devoting a little time to the study of his personal characteristics, instead of merely condemning him as useless at the job. It is bad psychology towards ourselves to condemn thoughtlessly; we are losing the services of a man who is in fact valuable.

Besides the face we have the assistance of the shape of the

PROFILE AND FULL FACE.

Take the profiles in the illustration. It is impossible in a brief article of this nature to go into the technical and scientific why and wherefore of the building of a head. It is clear, however, that, in the



main, the upper portion, containing as it does the brain, displays intellectual quality and capacity. The lower portion is associated with control and action or their lack. The profiles shown, as well as the full faces, are very distinctive.

No. 1 is the profile of an inquiring nature. He looks what he is—a pusher. A successful journalist, and also a good intelligence officer provided he can keep his mouth shut. Inclined to be impetuous.

No. 2. A head of beautiful balance. Thought and action combined with control. It is curious, but *form* is of great importance. Malformation also means crookedness somewhere in the mental or moral make-up. An insignificant nose goes with an insignificant nature. It is capable of demonstration.

No. 3. An extremely reliable and dependable nature. A man who will not act before he has thought it all over. Slow to come to a decision, but not easily altered from his own decision.

No. 4. A thinker who is not much good at anything else. A lover of books and not of exercise. A producer of theories and formulæ.

No. 5. A dangerous nature. Capable of thought, he lacks control, and must talk.

It is necessary to say that these profile types have been diagnosed personally, and the conclusions drawn are personal after careful study, as well as the full faces, and therefore they are open to disagreement.

The whole of what has been said about the profiles becomes modified or accentuated by the full face.

Fig. A. The perfect oval of the artistic mind and the thinker. The opposite of Fig. C, the man of action.

Fig. B. A combination of thought and action. In conjunction with No. 2, an ideal staff officer for operations.

Fig. C. The full face of action. The full face of a successful Air Vice-Marshal if he possesses a Senior Air Staff Officer who conforms with Fig. B, as quoted in the previous paragraph.

Fig. D. The jovial face. A man who has many friends and can be very useful. What he is capable of depends on his profile. Some such men have proved to be ideal political Intelligence Officers. Others merely fit to babble in clubs.

A great practical value underlies the foregoing. We can get a very sound general idea of the line of work a man is most suited for. By combining a knowledge of profiles, full faces, *and what the face tells us about a man*, we can know a little about him. If we find that our C.O. displays the characteristics of an inquiring mind and a thinker, we shall be careful, as good psychologists, to let him see what we have to say in writing, and give our reasons in detail. The unconscious reaction to him will be: "This man is excellent," and yet he does not realize why he thinks it. We can, on the other hand, become quite unpopular by not doing this, and we wonder why!

There is a niche for every one of the types described, and yet, to be quite frank, we cannot always in the Service expect to strike lucky. It is just as much up to us to look round and study our superiors, and make a real attempt at fitting into the niche in which we find ourselves. We shall come away with a widened outlook, and an improved adaptability to unforeseen situations, besides a good annual report!

CHARACTER.

If the interpretation of our experiences is making us what we are, and leaving indelible marks on our faces, in what way can we go forward to build up sound and strong characters?

The answer undoubtedly lies in volition, or the use of the will on a basis of *self-regard*, which is a development of the love sentiment. Without that self-regard, in the highest sense, a sound character will never be built up. We must take a pride in ourselves. There are two planes on which a man can and does act in the face of danger, for example :—

- (1) His personality, which includes will, throws its weight in on the side of the weaker motive, *i.e.*, to stay and see it through, *because of what the others will think*. That is the low plane.
- (2) Again, his personality forces a principle, imbibed long ago, to his focus of consciousness, and the will holds it there; "it is wrong and cowardly to run away." This is on a higher plane of moral development.

We can go a small step farther, which is also the all-important step farther, and say that, for the creation of a moral character in its fullest sense, a strong self-regarding sentiment *combined with some ideal* is essential. The motives supplied by this master sentiment *in the service of the ideal* must attain habitual predominance.

How is one going to achieve this? It depends on the power, the dynamic force which the ideal is capable of engendering in us. What is the ideal capable of doing this? We are forced back to where we began, and must say—love. Love of country, love of our work, love as a sentiment. We all know how, in the fraction of a second, love of a person can alter everything in relation to the loved one. What was duty ceases to be duty. All our instincts become controlled in a harmonious whole, under the ideal of a great love. The whole of our conduct of life is altered, because of the habitual dominance of the ideal. Every time an impulse (which some would call temptation) springs up, the master sentiment, consolidated by habitual action in accordance with its promptings, leads us to a self-regarding interpretation. The man of weak character allows himself to be moved by unorganized and fleeting impulses, which are sporadically evoked by each situation as it arises.

If the innate tendency of sympathy is strongly developed in such a man, he will be liable to be dominated first by one, then by another interest, according to the nature of the social influences that bear on him; the opinions and sentiments of any social circle he enters.

The logical conclusion with regard to the ideal which is the dynamic force behind the self-regarding sentiment and the will, leads us ultimately to a belief in, and a love for, God.

(To be continued.)

THE MILITARY SIGNIFICANCE OF STRATOSPHERIC AIRCRAFT

BY MAJOR OLIVER STEWART, M.C., A.F.C.

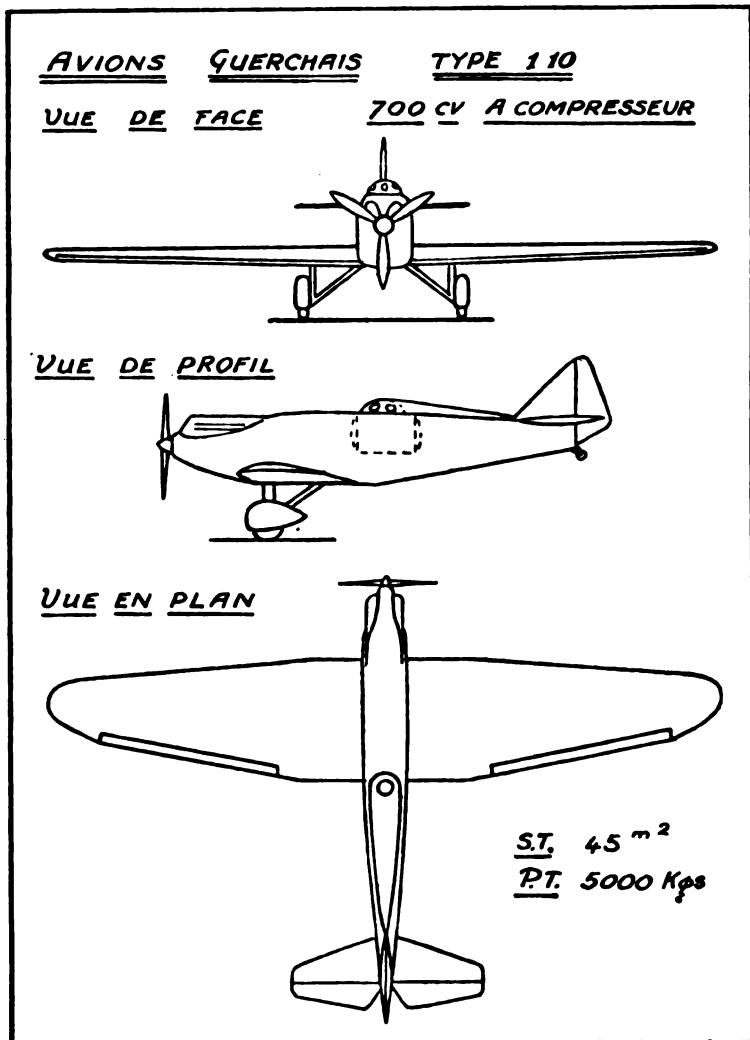
EVER since the war of 1914 the tactical value of height has been recognized for all forms of aerial engagement. An aeroplane that can outclimb its opponent holds the whip-hand, no matter how great that opponent's speed. If an aircraft can rise above another it does not matter, so far as attack and defence are concerned, whether that other is capable of travelling at 70 m.p.h. or at 700 m.p.h.; the security of the aircraft having the advantage of height is assured.

It is the more surprising, therefore, that the military significance of the experimental work that is being done on the Continent with aircraft designed to operate in the stratosphere has been ignored, ridiculed or dismissed as purely academic. Statements have been made saying that the stratospheric aircraft is being developed purely for commercial purposes; but many commercial assets can be turned into military assets. To-day there can no longer be any doubt that the Air Staffs of the chief powers are alive to the potential military importance of these experimental high-flying aircraft.

Originally the chief objective of those who turned their attention to stratospheric aircraft was a higher economic speed. The total resistance of an aircraft, these people argued, is made up of the resistance due to forward motion and the resistance due to lift; to horizontal and vertical resistance as they might be called. No matter what the height and the air density, a wing, to lift a given weight, must set up an equal amount of drag. But there are other aeroplane parts, such as the fuselage, the undercarriage, the struts and empennage whose drag, not being a function of the lift, decreases with increases in height.

When working near the ground, the horizontal resistance or resistance due to forward motion, is high in proportion to the total resistance. But at great heights, where the air is rarer, it is less high in proportion to the total resistance. It may be put in another way. At 300 m.p.h. the horizontal resistance of a given aircraft may be x at sea-level, and the vertical resistance may be y . Take the same aircraft up to 50,000 feet and, other things being equal, the horizontal resistance at the same speed will be but a fraction of x while the vertical resistance will remain y , the weight of the aircraft not having altered.

The sum of the resistances, therefore, will be lower and the horizontal resistance will bear a less important proportion to the total. What power is used will be devoted to holding the aircraft aloft and not



thrown away in overcoming horizontal drag. The result is that the economic speed at great heights, other things being equal, will be higher than at sea-level. Higher economic speed brings with it greater range, so that the stratospheric aircraft, if the practical difficulties can be overcome, will not only climb higher than the

conventional kind of aircraft; but will also have a much higher speed and a greater range.

Another feature is that it will also have a greater *speed range*. In order to obtain high speed near the ground, as we have seen in the Schneider Trophy seaplanes, high wing loading is necessary, perhaps exceeding 40 lb. per square foot, and calling for a high landing speed, in the region of 100 m.p.h. Now it has been pointed out that the lift remains constant according to the weight of the machine no matter what the height, so that, for a given speed and a given weight, the wing area of an aircraft designed to operate at 40,000 feet will be greater than the wing area of an aircraft designed to operate at 500 feet. The high-flying aircraft, therefore, will have a lower wing loading than the other, and a lower landing speed.

This has its effect upon the air-fighting characteristics of an aircraft. At a given height, say 32,000 feet, the margin of air speed over the stall for the conventional aircraft will be small, whereas for the stratospheric aircraft it will be great. The conventional aircraft will be "staggering" about on sharp turns, barely able to maintain height and only partially controllable. At the smallest increase in wing loading through centrifugal loads the machine will stall. Not so the stratospheric aircraft, which will remain fully controllable. The stratospheric aircraft will be, therefore, the first really high-speed aircraft with a low landing speed. With a top speed at 23,000 ft. of 250 m.p.h. it might be loaded at only 12 lb. per square foot. It will alter the whole complexion of speed range technique; it will possess speed *range* in the highest degree.

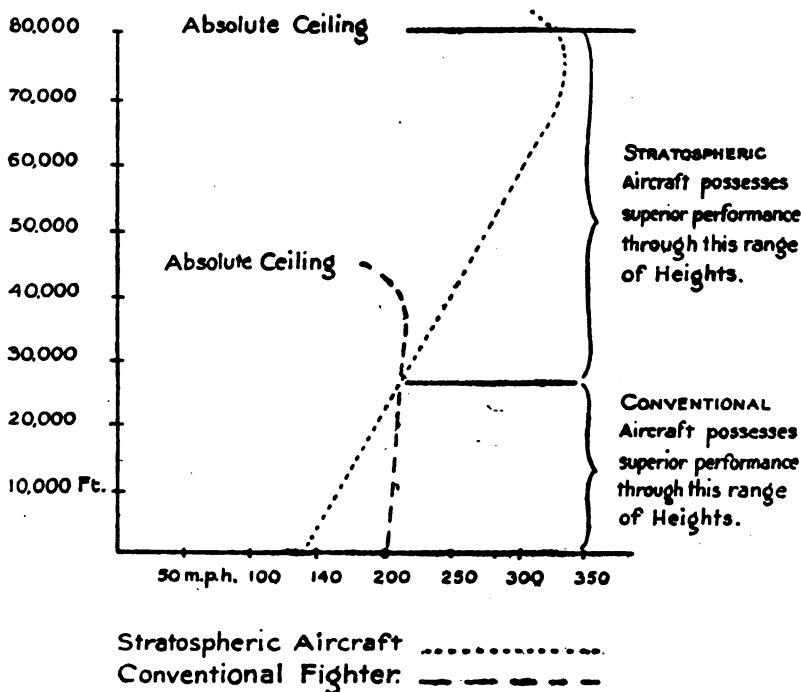
If it proves successful the stratospheric aircraft will possess the following advantages over the low altitude types:—It will have a higher top speed, a wider speed range and a greater range. And, over and above all these, it will possess the advantage of height. In fact there are no features in the whole range of aeronautics more vital to the military machine than those which the stratospheric aircraft, as visualized on the Continent to-day, ought to possess.

But it may be objected that this type of aircraft is still far from the practical stage and that it may fail. That is true. The aircraft now built or building will not be tried probably before the end of the summer or later. The problems of engines, airscrews, and pressure cabins for the occupants are immense and will require much work before they are resolved. But there is nothing in those problems to suggest that they are insoluble. The supercharging of aero-engines is now standard practice. There can be no insurmountable obstacle in the way of an extension of that practice to the degree necessary to obtain a sufficient output of power at the operating height. The engine for the Farman stratospheric aircraft is reported to have three

superchargers which the pilot brings into operation successively as he mounts.

The variable pitch airscrew for stratosphere flying is probably a more difficult problem than the engine. But again it is not a new problem. Variable pitch airscrews for use within the ordinary range of altitudes are already procurable. The Gloster-Hele-Shaw-Beacham is one example. The three-bladed Ratier fitted to the Guerchais stratospheric

OPERATIONAL COMPARISON OF STRATOSPHERIC
AND CONVENTIONAL MILITARY AIRCRAFT.



aircraft is another. Nothing more than an extension of the system is needed. The maintenance of a suitable engine temperature will be difficult; but again work has been begun in this direction and there is nothing to indicate that it cannot be continued.

From the aircraft designer's point of view the pressure cabin is really the only new problem. And the pressure cabin is the determining feature of the stratospheric aircraft; the feature that singles it out from other aircraft. Although it is possible that human beings could live if they were warmed and fed with oxygen at 50,000 feet, they could not live long. So that the pressure cabin is a necessity in the

stratospheric aircraft. It must be supplied, as the pressure cabins of the Continental experimental machines are supplied, with a pressure pump, with warming apparatus, with an oxygen supply system, and with a means of exhausting the used air.

The problem is similar to that attacked by the submarine designer but probably not so difficult. For the maximum pressure which this pressure cabin can be called upon to withstand, from within outwards, will obviously be atmospheric pressure, a small amount compared with the immense pressures in the other sense which may be met with in a submarine. But, although the pressure cabin seems a small problem compared with the submarine, it is a problem. The oil-sealed glands for leading the controls through to the interior of the cabin, for instance, and the provision of good view for the pilot, will take a good deal of thought and of practical experiment.

In one French machine the pilot is housed in a sort of tank, and gets into it through a man-hole. There is a double window with a device for preventing fogging-up of the glass. The altitudes at which these aircraft will develop their highest speeds vary. The Farman has a calculated operational height of 62,700 feet, at which height it is hoped that it will be able to fly at 317 m.p.h. At 32,808 feet it has a calculated speed of 245 m.p.h., while at ground level its top speed will be only 129 m.p.h. The Junkers also is designed for a very high performance, and, according to report, the Guerdais has a speed of 209.3 m.p.h. at sea level and 248.55 m.p.h. at 23,000 feet. It will climb—if its designer's figures are borne out in practice—to 49,200 feet in 50 min. 52 sec. Its engine is a 700 h.p. Lorraine with a special blower and it has a three-bladed variable pitch Ratier airscrew.

There is no reason to suspect that the stratospheric aircraft will not eventually be developed into a practical machine, both for military purposes and for civil purposes. For military purposes it may be visualized as a day bomber and as a fighter, the one producing the necessity for the other. It is worth examining briefly the advantages height would confer for these particular duties.

The function of the day bomber is to carry a load of bombs to a given objective, to deposit them and to return. For the actual bombing the machine must be able to fight and it must face anti-aircraft gun-fire. But on the journey out, and part of the journey back, the ability to fly very high, that is at more than 40,000 feet, would be of value both tactically and psychologically.

On the outward journey the machine would be able to avoid anti-aircraft gun-fire and would be unlikely to be attacked by defending aircraft. The entire defence system of this country, and of most other countries at present, is based upon the accurate "spotting" and report of approaching hostile aircraft by ground observers. The

system of continuous defensive air patrol, if it is to be used at all, is to be aided by ground observation. Moreover, the system of continuous air patrol becomes less and less effective as the range of heights of the attacking aircraft increases.

If the operational height of day bombers is raised from 20,000 feet to 40,000 feet the cubic space to be searched is doubled, and for Great Britain would come to some 45,000 cubic miles. If the hostile aircraft cannot be seen from the ground the chances of their passing through the defences without being attacked are greatly increased. Clearly if two powers were at war and only one of them possessed stratospheric aircraft, that power would possess a great, if not a decisive advantage, at the outset. It would not only be able to raid places much farther into enemy territory; but it would also have a better chance of completing the raids without its own machines being shot down.

Nor is the psychological advantage to be gained by high flying on the outward journey to be neglected. Height was shown to be psychologically beneficial for nearly all air duties during the war of 1914. The crews of the bombers, knowing that they cannot be attacked, and keeping all the time beyond the range of accurate anti-aircraft fire, arrive at their objectives fresh. The same could be said of long-distance photographic and reconnaissance patrols. For the return journey the aircraft would climb. They might, and probably would, be attacked while at relatively low altitudes doing their bombing or photography; but they would afterwards again seek to gain height. And the higher they went the better their rate of climb, and the less the chances of pursuing aircraft catching them. At a great height, too, the specially designed stratospheric aircraft would be more controllable than the normal machine working near its ceiling.

The vulnerability of the stratospheric aircraft has been exaggerated. A bullet through the pressure chamber would not be likely to destroy it. The occupants could probably maintain consciousness sufficiently long to bring their aircraft down to the height where life can be supported. And if it was found that the time taken to descend to that height was so great as to endanger life, some inverted form of the "Davis" apparatus might be provided.

Probably the greatest difficulties in the way of the military use of stratosphere aircraft are those having to do with the operation of the guns at great heights, and with the provision of a sufficiently good view for the pilot. But nothing so far has occurred to indicate that these are insuperable difficulties. We have seen a period of intense concentration on speed; the next step will be a period of intense concentration on height. The stratospheric military aircraft will appear, and when it appears it will produce fundamental tactical changes.

WIRELESS DIRECTION-FINDING AS AN AID TO AIR NAVIGATION

BY FLIGHT-LIEUTENANT J. A. McDONALD, *p.s.a.*, R.A.F.

GENERAL.

AIR Publication 1234 "Manual of Air Pilotage" informs us that the art of Air Pilotage lies in conducting an aircraft from place to place by dead-reckoning, map reading and fixing position by observations on terrestrial objects. It includes the ability to maintain a given direction in or above clouds and mist and by night.

Apart from flying by sight and knowledge of the country, the art of navigating any aircraft depends primarily on being able to determine the position of that craft with relation to one or more fixed points. The position may be obtained either in the form of a bearing on, and a distance from any fixed point, or of simultaneous bearings from two or more fixed points, which bearings are laid off on a chart or map and denote by their inter-section the position of the aircraft at the time.

In practice, the former method of obtaining the position of the aircraft is seldom employed owing to the difficulty of gauging the distance in a direct line, the latter method is therefore almost universally used, and different means are employed for ascertaining the bearings of the fixed points.

The aircraft is, without doubt, one of the most difficult craft to navigate by the traditional visual methods; for one thing it is not always possible in a formation of two-seater aircraft to carry a navigator, the responsibility resting with the pilot himself who, in addition to navigation must attend to his aircraft and concentrate on his mission. If a navigator is carried, except in the larger types of aircraft, he must work under most uncomfortable and inconvenient conditions. Again, there is the necessity for aircraft to fly on occasions in or above clouds when for tactical reasons it is important that the aircraft should not be hindered in its mission, for example, by anti-aircraft fire or attack by fighters.

Lastly there are conditions of visibility, particularly in fog and darkness which render usual means of navigation unreliable and it is under such conditions that the pilot requires the greatest amount of assistance. Deprived of landmarks, a pilot is compelled to fly by his instruments and there is no doubt that under such conditions wireless direction-finding can play a most important part.

Although the importance of wireless direction-finding as an aid to air navigation is now appreciated throughout the Royal Air Force, it is a regrettable fact that there is widespread ignorance of the funda-

mental principles and hence the comparative merits of the various systems now in process of development. It is the purpose of this article briefly to explain and compare these systems without going into much technical detail.

Wireless direction-finding systems can be divided into two basic types as follows:—

- (1) Those that employ directional transmission from a fixed point on the ground and non-directional reception in the aircraft.
- (2) Those that employ non-directional transmission from a fixed point and directional reception in the aircraft.

DIRECTIONAL TRANSMISSION SYSTEMS.

The systems under this heading at present under development are provided by the "equisignal" beacon and the "rotating beacon" transmitters. Each of these comprises a fairly powerful and costly transmitter which cannot be moved at short notice. These systems are therefore unlikely to be useful in undeveloped countries where adequate facilities are not available. Their range from ground to air is of the order of 150 miles so that they are more adaptable to a Home Defence Organization than an Expeditionary Force operating overseas.

THE EQUISIGNAL BEACON.

The equisignal beacon transmitter is the outcome mainly of development undertaken by the Bureau of Standards in America.

The transmitter provides a number of "zones" of equal signal strength, which radiate in straight lines from the transmitting aerial system and which can be oriented in any desired direction; the presence of the "zones" is indicated to the pilot of an aircraft either by means of a characteristic signal received in the telephones of his receiver, or by means of a visual indicator installed on the dash-board of his aircraft and operated by his receiver.

By means of either indicator the pilot is continuously notified whether he is on his correct course or not, and if not, whether he is to port or to starboard of the course. Such indication does not, in itself, give the pilot any information as to his actual position, *i.e.*, how far along the particular course he has flown; this information is supplied by what are known as "marker" beacons, which are erected at periodic intervals along each course of the route, and which comprise low-power non-directional transmitters, each of which transmits a characteristic signal which is received by the pilot in the form of either an aural or a visual indication. The ground-to-air range of such marker beacons is small, being of the order of five miles, and their purpose is simply to "mark off" each course and give the pilot an automatic indication of position as well as of his course. Arrangements can also be made whereby telephone transmission from

either main or marker beacons can be temporarily provided in place of the normal beacon transmission; by this means, information as to route, weather conditions, etc., may be broadcast to pilots flying along the route.

The results obtained with this system under conditions of daylight are very satisfactory, ranges of up to 120 miles or so having been obtained on numerous occasions, the width of the equisignal zone being of the order of three miles at a distance of sixty miles from the transmitter, *i.e.*, the angular width of the zone being of the order of three degrees.

In this connection it is of interest to note that the use of a vertical rod aerial in the aircraft for reception purposes is claimed to be an essential factor in securing freedom from "night effects," *i.e.*, in permitting of the system giving us accurate results by night as by day; a considerable body of technical opinion is, however, doubtful if this is the case, since from a purely scientific study of the matter, it would appear that "night effect" is bound to be present with this system, although the magnitude of such effect may be so small as not seriously to impair the practical efficiency of such a system at night. Prolonged and extensive tests during darkness have not at present been carried out in this country, and the results of such tests, when they are made, will doubtless be of the greatest interest both to the Royal Air Force and to aircraft operating companies and their pilots.

A further criticism of the use of a vertical rod aerial is that it is difficult to construct such an aerial which, while being airworthy, will not seriously detract from the performance of the aircraft. Furthermore, the use of such an aerial necessitates the complete screening of the engine ignition system, on account of the small pick-up obtained and the consequent need for extremely high amplification in the receiver; this latter requirement involves additional cost and weight and maintenance difficulties, and is not welcomed, at the present time, by the aircraft contractor.

The equisignal type of beacon is obviously only applicable where each of the routes to be followed consists of a number of straight-line courses, each course being of some considerable length (for example, 50 to 100 miles), as otherwise the cost of the numerous beacon transmitters which would have to be installed to cover the route would be prohibitive; furthermore, it has the disadvantage of concentrating aircraft flying in a given area along one or more sharply defined courses, with the resultant increased risk of collision during conditions of poor visibility.

The equisignal beacon is therefore unlikely to meet the operational requirements of the Royal Air Force, though its progress in the development of Civil Aviation must always be of great interest. The

Marconi Company are at present engaged in erecting a beacon of this type at the Croydon Air Port and it will be interesting to note the use made by civil aircraft of the system when it has been installed for a period.

THE ROTATING BEACON.

The Rotating Beacon is the outcome of research work carried out, since the war, at the Royal Aircraft Establishment, although its commercial development is now in the hands of the Marconi Co. One beacon is in continuous operation and erected at Orfordness, near Felixstowe. One experimental beacon is in operation at Cove, near Farnborough.

In addition to the Royal Air Force trials, very favourable reports from ships on the value of the Orfordness beacon have been received at the Air Ministry from the Board of Trade.

The principle on which the rotating beacon works is very simple. The transmitting aerial consists of a rectangular frame which rotates once in one minute. It is the property of such a frame that the signals from it at a given receiver are strongest when the frame points towards the receiver, the signals gradually decreasing in intensity as the frame is rotated until they vanish when the line from the transmitter to the receiver is exactly at right angles to the frame. As the frame is further rotated the signals again increase, the whole effect, therefore, being similar to that met with in the case of a portable broadcast receiver. The vanishing point is very sharply defined. An observer knowing the rate of revolution of the beacon and provided with (a) a stop watch, and (b) a means of observing both the starting signal and the minima as they pass him, will be in a position to calculate by simple computation the time interval between these two observations, and hence the angle through which the minimum has swept between the true N-S plane and the plane formed by a line joining his position to that of the beacon, *i.e.*, he will know the true bearing of the beacon from his position. An observer, accordingly, starts his stop-watch when he hears the characteristic N-S. signal, and stops it when he hears the first of the two minima, which, as stated above, are extremely sharply defined and can, with practice, be gauged to less than one half of a second; the position of the seconds hand then gives him a direct indication of the bearing of the beacon from him.

From the foregoing it will be seen that no extra equipment is required in the aircraft over and above the normal receiver—apart from the stop-watch—and what is more important, any number of aircraft can avail themselves simultaneously of the direction-finding service; furthermore, the service is not—as in the case of the equisignal beacon—confined to certain pre-determined straight-line courses radiating from the beacon, but is available in any direction from the beacon up

to the limit of range available. Unfortunately, by virtue of the fact that the radiating circuit of the transmitter is extremely inefficient, comprising a relatively small closed loop of wire (which is revolved, as explained earlier), the power of this type of beacon, and hence its cost, has, for a given range, to be greater than that of any other type of directive or non-directive ground beacon transmitter; furthermore, with this type of beacon freedom from night effects cannot be definitely guaranteed, *i.e.*, the accuracy of the system at night is liable to be of a lower order than that obtainable by day.

In practice, however, exceedingly successful results have been obtained in daylight with beacons of this type, an average accuracy of within a degree or two being possible when observations are made on the ground, and within three to five degrees when the observations are made in the air; under certain conditions it is possible to foresee a great use for a chain of beacons of this type, especially where navigational aid is required over an area in which aircraft are not flying along a few pre-determined routes.

The rotating beacon can be said to fulfil certain important navigational requirements in the Royal Air Force, and is well suited to a home defence organization. Its disadvantages for operations overseas are that it is almost impossible to erect on a mobile basis, and requires adequate ground facilities in electrical power and machinery. It is also possible that an enemy with modern wireless equipment could make use of our beacons unless certain measures were taken to make his readings misleading, but it is outside the scope of this article to discuss these measures.

DIRECTIONAL RECEPTION SYSTEMS.

General Principles.

The basic principle underlying the operation of all systems of directional reception is that the reception properties of an aerial consisting of a simple loop of wire are directive, being at a maximum in the plane containing the loop and at a minimum at right angles to this plane, the two maxima in the plane of the loop, which are, of course, 180 degrees apart, are broadly defined, whereas the minima at right angles to this plane are extremely sharply defined. Hence, if the loop aerial be connected to a receiver, tuned to the wavelength of the transmitter whose direction it is desired to ascertain, and slowly rotated in the field produced by this transmitter, two positions of the loop will be found in which the strength of the received signal will rapidly decrease to zero and as rapidly increase again in audibility; these two positions of the loop will, of course, be in the same plane (*i.e.*, will be 180 degrees apart), and this plane will be at right angles to the plane joining the source of the transmitted signal and the directional receiver. From this



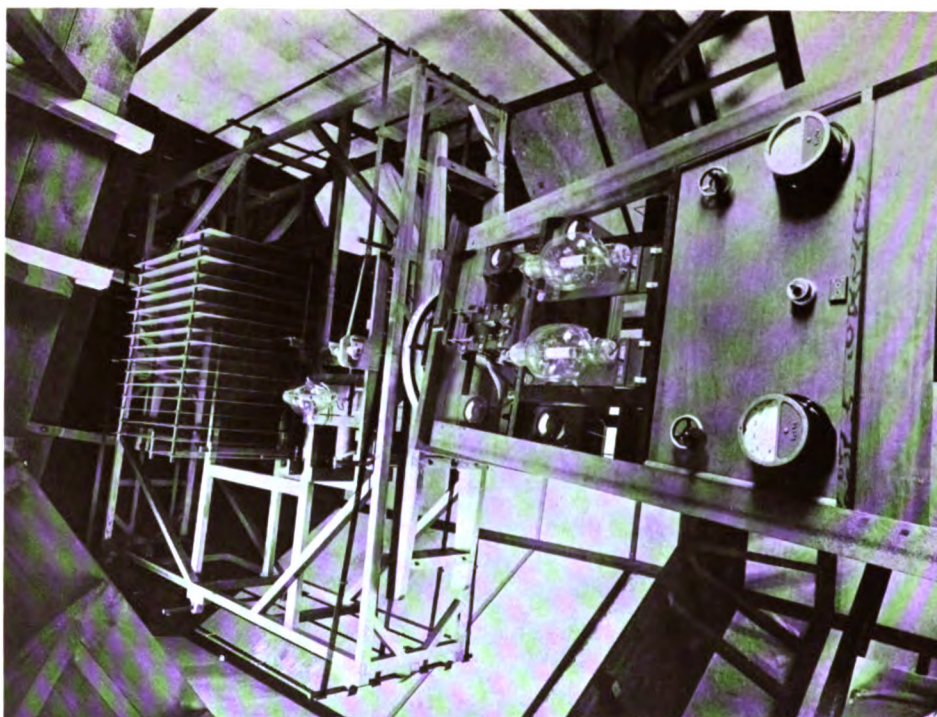
[Photo : R.A.F. Official, Crown Copyright Reserved.

THE HAWKER TWO-SEATER FIGHTER.
(Rolls-Royce "Kestrel" Engine.)

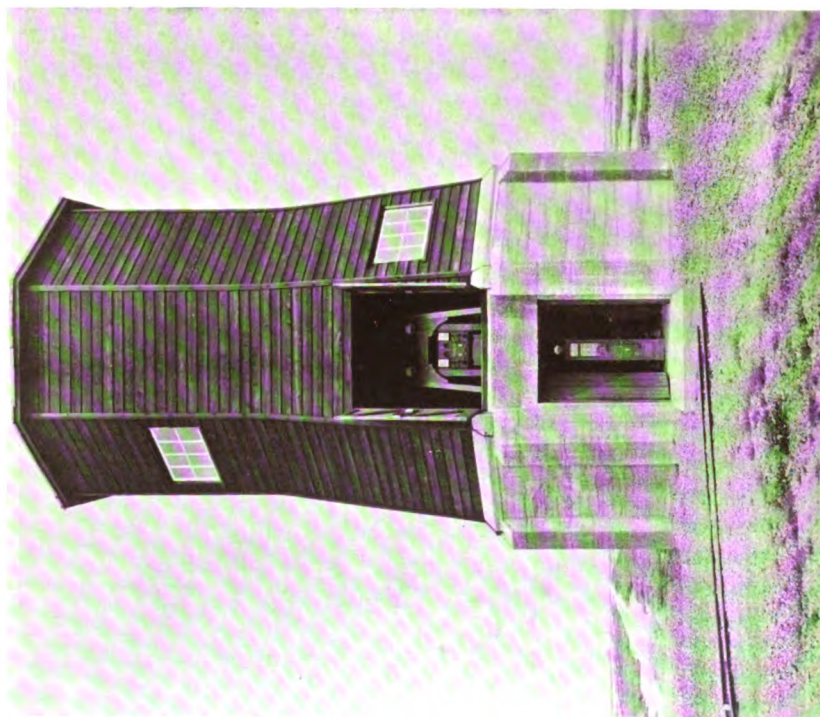


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THE HAWKER SINGLE-SEATER FLEET FIGHTER.
(Armstrong Siddeley "Panther" Engine.)

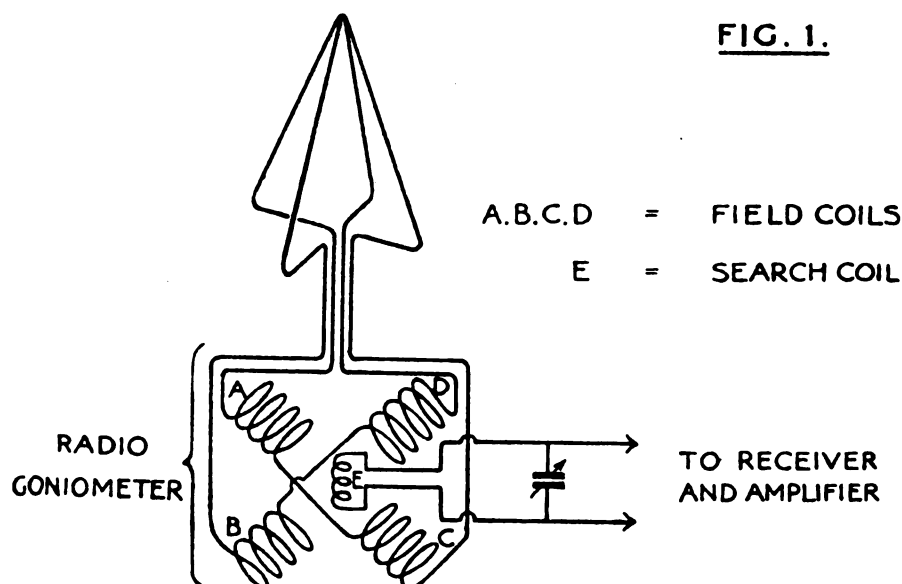


[Photos : R.A.F. Official, Crown Copyright Reserved.
THE ORFORDNESS ROTATING BEACON (Interior),



THE ORFORDNESS ROTATING BEACON (Exterior),

it follows that the orientation of this latter plane can be ascertained with no small measure of accuracy, the only information which is lacking in this simple system being that the actual bearing of the transmitting station relative to the directional receiver is subject to an ambiguity of 180 degrees. In the various systems which have been developed from this simple system, devices are, in most cases, incorporated in order to overcome this ambiguity and to give the actual bearing of the transmitting station. Before describing the more important of these systems it is as well to point out that in most cases the directional receiver



can either be installed on the ground (and take bearings of the aircraft transmissions), or can be installed in the aircraft (and take bearings on transmissions emanating from known points on the ground). There is, however, one exception to this rule, which occurs in the case of the Marconi-Adcock system, in which the aerial system necessary could only be installed on the ground, for both technical and practical reasons.

THE BELLINI-TOSI SYSTEM.

This method is not generally used in aircraft, but is used at direction-finding ground stations. The principle is illustrated in Fig. 1.

The aerial system comprises two loops of wire rigidly supported at right angles to each other and to the horizontal; each loop is split at the centre of its base, and a pair of leads run from there to the apparatus which is employed for taking bearings; *i.e.*, the radiogoniometer. This latter comprises a relatively small unit containing two

coils of wire rigidly and accurately supported at right angles to each other (the field coils A, B, C and D), within which coils lies a rotatable coil called the search coil E. This latter is mounted on a spindle, one end of which projects through to the outside of the case containing the field and search coils, where it is provided with a knob of convenient size for comfortable operation, and with a pointer, which rotates with, and at any moment indicates the position of the search coil. A carefully engraved scale from nought degrees to 360 degrees, is provided on the outside of the case, in such a manner that the orientation of the pointer can be read with great accuracy. From the search coil of the radiogoniometer two leads run to the tuning and amplifying circuits, the output of the latter being taken to a pair of telephones.

Transmissions arriving from any particular direction induce currents in each loop and hence in each field coil, their magnitude depending on the angle formed by the plane of the loop and the line joining the transmitting and receiving stations; the result is the formation of a "resultant field" within the field coils, the plane of this field being identical with that of the incoming transmission. By rotating the search coil within this field, therefore, an operation is performed which is identical with that which takes place when a simple loop aerial is rotated in the field of a transmitter, *i.e.*, two broadly defined positions will be found where signal strength is at a maximum, and two sharply defined positions where the signal strength is at a minimum.

In practice it is found much easier to detect the position of the minimum than the maximum signal, and hence, when searching, the minimum signal is used, the resultant constant error of 90 degrees being compensated for by the simple expedient of giving the pointer on the goniometer a 90 degrees advance. A variable condenser is connected across the search coil and owing to the close coupling which exists between the search coil and the coils of the goniometer the adjustment condenser is all that is necessary to bring the system into tune with the transmission from the aircraft.

This system can be made applicable to either ground or aircraft use. In the former case, the aerial system usually comprises two single turn loops of triangular shape supported on a central mast some 80 feet in height and having a base of some 100 feet or so. Such a station, if erected at an aerodrome, can ascertain the bearing of transmissions emanating from an aircraft, and hence of the aircraft itself; furthermore, by providing two or more such stations to cover a particular route, with a rapid means of intercommunication between them, it is possible to ascertain with great accuracy the position of an aircraft by taking simultaneous bearings on the aircraft's transmission at each station, laying off the bearings on a chart, and ascertaining the resultant position as given by the intersection of the bearings. The advantages

offered by this system are (a) that the pilot is given an actual position without any necessity for calculations on his part; (b) the process of obtaining a position is effected in a very short time, a minute and-half sufficing so far as British D.F. stations are concerned; (c) the system is capable of great accuracy by day; (d) a net work of such stations can serve a large area not being confined to a few directions as in the case of the equisignal beacon. On the other hand, there are certain disadvantages with the system which are as follows:—(a) In order to obtain a bearing or a position, a transmission from the aircraft is necessary. In these days when W/T traffic is becoming relatively dense, the wave allotted for aircraft communications is congested and any extra transmissions on this wave should be eliminated; of course, this can be overcome to a certain extent by utilizing a different wavelength for D.F. purposes than for normal communications, but this involves the provision of two receivers (and possibly two transmitters) on the ground—one for normal communication work and the second exclusively for D.F. purposes; (b) Only one aircraft can be served at a time, by any given D.F. station or stations; with dense traffic in any particular area, when conditions of visibility are bad, the delay in service which occurs is often a matter of some import.

Where the Bellini-Tosi system is applied to aircraft, *i.e.*, where the receiver is installed in the aircraft, the aerial system comprises two single or multi-turn loops insulated from, but rigidly fixed to the structure of the aircraft; the planes of the loops being 90 degrees apart. Operation of the direction-finder is in all respects similar to when installed on the ground. Bearings can be taken on any known ground transmitter whose wavelength lies within the wave band of the receiver and hence—by laying-off methods—the position of the aircraft can be calculated with considerable accuracy. In 1928 when Captain Courtney forced-landed during an attempted transatlantic flight his rescue can be ascribed to the fact that he carried both Bellini-Tosi direction-finding and aircraft transmitting equipment installed by the Marconi Company.

All bearings taken by direction-finding apparatus in aircraft, either with coils fixed to the wings or with revolving coils mounted in the fuselage, are subject to a quadrantal error due to the wireless waves being deflected by the metal of the aircraft. In order to allow for this error by applying the necessary deviation, the navigator must have in his possession a table of quadrantal error corrections. These corrections are obtained by swinging the aircraft in a similar method to that required for taking compass deviation. The aircraft is taken to an open space clear of surrounding buildings, and bearings taken on known W/T transmitting stations. Knowing the true bearing of the transmitting station and the bearing given by the D.F. coil, then

the difference between these figures gives the quadrantal error which may be plus or minus depending on whether the bearing from the aircraft is greater or less than the true bearing.

The chief advantage of this method is, therefore, that it enables aircraft to take bearings on any ground wireless transmitting station and obtain navigational aid without the necessity for any transmission from the aircraft and without assistance from the ground.

On the other hand, however, the operation of taking bearings and of laying them off for calculating position necessitates carrying a navigator or trained W/T operator in the aircraft, which is only feasible in the larger types of aircraft. If the range of the system is to be effective a sensitive receiver and careful screening of the engine ignition system are necessary to ensure freedom from interference.

One grave defect is present in the system; this is that at any time between sunset and sunrise it may be impossible to obtain satisfactory bearings owing to what is termed "night effect." At certain times, while "night effect" is present, the minimum on which the bearing is taken is so badly defined as to make it impossible to take an observation; at others the minima are sharply defined but inaccurate, and at other times they are normal. The result is that this D.F. method cannot be guaranteed at night and this has led to the evolution of the Adcock system which is now in process of being tried out in the Royal Air Force.

THE ADCOCK SYSTEM.

This system has been developed during 1930-31, in order to provide a service having all the advantages provided by the Bellini-Tosi system but lacking its chief disadvantage, *i.e.*, the susceptibility to "night effect." In this it has been remarkably successful, as searching tests have shown, and it is anticipated that this system will be in extensive use in the very near future, as it is the only system at present in existence which will permit of an accurate D.F. navigational service being given at night.

"Night effect," in so far as it effects wireless direction-finding systems, is due to the effect on a normal directive aerial system of vertically polarized waves, which have been reflected from the Heaviside layer and which, in combination with the non-polarized waves which have travelled along the earth's surface from the transmitting aerial, produce an effect which results in the normal directive properties of the receiving aerial system being distorted—and, in some cases rendered non-existent. These effects are, unfortunately, completely variable, and may vary from second to second, minute to minute, and hour to hour; hence, any D.F. system that is affected by such reflected waves is practically useless during darkness.

The principle of the Adcock system is to provide an aerial system

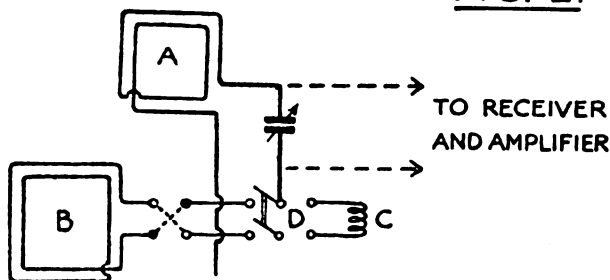
that is unaffected by these reflected waves and is only affected by the direct waves. The aerial system is at present only applicable to D.F. ground stations and involves the erection of four self-supporting wooden masts 70 feet in height and arranged at the four corners of a square whose diagonal length is approximately 300 feet. Single wires are suspended from the top of these masts, each wire being connected to a junction box about five feet from the ground. From these junction boxes specially constructed feeder tubes made of copper connect with the goniometer which is provided with a metallic screen.

In so far as the basic principles underlying his system are concerned, *i.e.*, the use of a radiogoniometer, there is no difference from the standard Bellini-Tosi system, and the method of operation is identical with the fundamental advantage that "night effect" is eliminated and a satisfactory service can be offered when it is most required, *i.e.*, during conditions of fog or low cloud at night.

THE ROBINSON METHOD

FIG. 2.

- A - Main loop
- B - Auxiliary loop
- C - Compensating inductance
- D - Reversing switch



"The Robinson or Royal Air Force Method."

The Robinson or Royal Air Force method was developed during the war and was successfully operated during 1918 on some of the larger types of aircraft then available—for example, the Handley Page o/400 and "V" type 1500 and F.5 flying boat.

During 1919 a demonstration was given to the late Air Vice-Marshal, Sir Sefton Brancker, during which a Handley Page aircraft was navigated between London, Le Bourget and Dungeness entirely by the Robinson method.

Its development since the war has been retarded because the types of aircraft available have not been suitable in many cases for the installation of the system, and also the training of the Home Defence night bombers has been restricted to this country, rendering the carrying of the apparatus for this system redundant.

During the past twelve months the system, modified for use with a trailing aerial and single wire loop, has been re-installed in flying

boats operating in the Far East, and extended trials are now in process to ascertain the value of the system installed in these aircraft when carrying out long-distance cruises and survey work.

In aircraft several factors exist to limit the use of the minimum method, the chief of which, perhaps, is the noise made by the engine. The Robinson method aims at the accuracy of the minimum method whilst permitting loud signals at the time of taking the bearings. Apart from the fact that louder signals can be heard above extraneous noise there is the advantage that the receiving operator may be reading the signals at the same time that he is taking the bearings, a feat not possible when the minimum method is being employed.

A diagrammatic arrangement of the Robinson method is given in Fig. 2 and the action may be explained in the following way. Two frame aerials marked in the diagram "Main Loop" and "Auxiliary Loop" are fixed rigidly at right angles to one another and are capable of being rotated about a vertical axis, either by being mounted on suitable bearings or fixed in the aircraft to lie fore and aft, or athwartships, and the whole aircraft turned. The frames are connected in series through a reversing switch which can be quickly changed from one position to another. Assuming that one frame is at the position for maximum signals from a given station then the other being at right angles will be at a minimum position. As no currents are induced in the last mentioned frame there will be neither an opposing nor assisting effect due to its series connection, and it will be immaterial which way round it is connected. If, however, the system is turned from this position, voltage will be induced in both frames, and reversing the connections of one of them will produce either an opposing or assisting effect when signals will be either reduced or increased in strength, according to the position of the reversing switch. To obtain a bearing the system is rotated until a point is found where the signal intensity is equal on either position of the reversing switch. The minimum frame in this system is, therefore, the controlling one, but is arranged to modify a loud signal. In practice it is usual to increase the size of the minimum or auxiliary frame to accentuate its controlling effect.

It will be seen in the diagram that a second switch has been provided which disconnects the auxiliary loop. This switch is necessary to obviate a possible 90 degrees ambiguity in the bearings by taking a rough preliminary bearing with the maximum position of the main loop, the compensating inductance C being introduced to keep the circuit steady.

The main advantage of this system is that the controls may be arranged in a box for easy manipulation by the pilot, the aircraft then being automatically guided to a fixed destination.

There are two main disadvantages to the Robinson system; the chief of these is that the system is not free from "night effects" similar to those referred to previously in this article. The extent to which such effect will prevent successful operation of the system is still under investigation. The second disadvantage is that should a wind be blowing across the direct line joining the aircraft and its destination the aircraft, while eventually reaching its destination, will not do so by the shortest route, *i.e.*, its path will be a curve, constant corrections being necessary by the pilot.

COMPARISON OF THE VARIOUS METHODS OF WIRELESS DIRECTION-FINDING AIDS TO AIR NAVIGATION.

It will be of interest now to compare briefly the methods described in this paper.

The Equisignal Beacon.

The system requires elaborate ground equipment. It necessitates the aircraft flying on fixed courses. A limited number of courses only are available. No skill is required by the pilot and wind-drift is counteracted. The system is more applicable to fixed civil air routes than to the mobile requirements of air warfare.

The Rotating Beacon.

The system necessitates elaborate ground equipment. Drift can be checked by determining positions periodically and applying correction. It is capable of giving simultaneous service to any number of aircraft up to a range of about 150 miles. Since the determination of a minimum signal must be made the system is particularly subject to interference. The system is suited to Air Defence requirements.

Bellini-Tosi Method (Ground).

Two or more direction-finding stations with an intercommunication system are necessary in order to fix the position of the aircraft. Simultaneous service to more than one aircraft is not possible. Two-way communication between the aircraft and one direction-finding station is essential. The system is suited to Air Defence requirements.

Bellini-Tosi Method (Air) and Robinson Method.

Available radio stations may be utilized, and guidance obtained, in any desired direction. Simultaneous service to any number of aircraft is possible. Complicated equipment must, however, be carried in the aircraft which may affect its performance. It does not take account of wind-drift, resulting in circuitous courses to a destination.

The system is admirably adapted for use overseas, especially in war, when time and available facilities preclude the possibility of erecting beacons.

THE RETURN

A Tale of Mahmoud

BY FLIGHT-LIEUTENANT F. M. DENNY.

AT last, after many weary months of captivity, Hirst and I are to be returned to the British Government. Our recent jaundice and a doctor's persuasive tongue have proved too worrying for Sheikh Mahmoud and he has promised to release us within ten days.

Dawn some two weeks later shows a Kurdish village full of activity and movement. The women have been astir for an hour or more already, baking, packing, provisioning, curdling milk for mast, and even some of the men are moving about saddling horses and strapping boxes on to their backs. Our guards are excited and ready to move long before even breakfast has appeared. From the Sheikh's house opposite comes a thin wisp of smoke, Rachma must be preparing breakfast. After an interminable delay, during which our empty stomachs make us curse everyone for the early rising, a tray of mast, chupatti, and boiled eggs is brought. The mast is very sour, the milk having curdled in it, but what does it matter when it is for the last time?

Then Majid Effendi looks in, cheery and debonnaire as usual : he has brought his chestnut for me to ride. I thank him ruefully, thinking of how it had bolted with me the day before and how I had only just prevented it from knocking down a summer-house by the use of full opposite rudder and the power of prayer. Mahmoud's horse has just been taken by, saddled, and all the visiting tribesmen are moving down into the valley from the ground behind the village where they spent the night.

Now we shall be off for Mahmoud is mounting his horse. He is more carefully dressed than his fellows and looks theatrically business-like in his long boots and baggy trousers; an automatic pistol and a knife are stuck in his belt, and a pair of binoculars slung over his shoulder. A blend of Haroun and Falstaff, he is of medium height and about forty years old.

The leaders move off into the valley and along a broad stony track followed by us and the baggage on mules. There is Hama astride a horse, leading a donkey laden with blankets; the Sheikh's own tea urn on one side balancing his huqah on the other. No sinecure this, for he must be sufficiently up at every halt to provide a smoke or tea if the sheikh requires it.

We walk the horses to the end of the yellowed valley and climb the hillside, scrub and trees obscuring the view, until in a short time we see a knife-edged range opposite and descend again to a little tree-covered strip and a diagonal cleft through the hills. The rock towers vertically above us in this cleft and the horses slide and slip on the rocky path. We proceed for some distance in single file before turning half-left. A few miles further on the track slowly opens out into a little boulder strewn plain, not above a half-mile wide. Grey rocky walls all around, and a village away in the hills to the right.

A stir, and a pulling of horses, and I am doing all I can to prevent my beast from joining in the headlong rush to meet the local tribesmen. All are mounted and armed and rush indiscriminately at each other, to meet with a sudden check and uprearing of horses—while the young bloods gallop round the outside firing off a few rounds into the air.

We move into Dizlee and stop at Mahmoud Khan Dizlee's house for lunch. Trays of bread flaps, sweetmeats, and dawdlemain, to which we do ample justice. Here Dizlee appears and says, "English very bad." Mustapha, the interpreter, comes and tells me a long tale of how it is impossible to reach the British that night, and will I write a letter saying so? After some hesitation I agree, and the letter is sent on ahead by messenger.

After a cigarette we say farewell to Dizlee and ride along straight into the highest and roughest-looking mountain; slipping, leaping, clambering, up and up on to the summit until, when there appears to be no outlet, we sweep to the left and on to a pass, broad enough for several horses abreast. Majid rides with me and we converse in French on the Great War, and the British and Turks—for he had been a cadet at Constantinople before the war and later served with Liman von Sanders. He knew Sofia and the Eastern capitals, and, although his French was worse than mine, we managed to understand each other.

Then round a corner of rock I saw stretched out some 5,000 feet below the Halebja valley, a daily sight before my flying ceased. I suppose Moses had similar feelings when he was shown the promised land; I wondered whether we should have a similar fate, for I could not, dared not, believe that we should be released.

We begin to descend now, but the track is too steep to ride down, and so we dismount and lead the horses slipping and slithering past caves which have been used as funk-holes from aircraft. Only these stocky hill-bred horses could do it; hocks are bleeding freely. Down and across the mountainside and we plunge into a veritable well in that tremendous landscape, vanishing into the dusk to find at the bottom camp fires burning, and the horses off-saddled and grazing. The only egress is up the walls and out on to the mountainside again.

We grope wearily across to a large blazing fire—night has descended

R

upon everything even as we plunged into this well—and find Mahmoud sitting before it with his followers around him. He is in merry mood, the huqah is pulling well.

After bread flaps and boiled eggs we are sipping the bitter coffee when an answer to my letter arrives from the Khurmal garrison. In effect it states that nothing is known about us and that a Government official is expected the next day. Evidently it was a ruse of the Sheikh's to get a look at the ground. For an hour or two Majid and I discuss Gladstone and Disraeli, and then, wrapping ourselves in blankets, fall asleep by the fire. I remember gazing up out of that wall of darkness, the mountainous walls towering above in an indistinct outline, and seeing some stars twinkling above it all. Oh! so far away and unattainable.

Cramped and frozen next morning we break camp and climb out on to the hillside only to halt again for some breakfast—though breakfast there is none, and this is scarcely odd because . . . the Sheikh's commissariat has broken down and so we have tea instead. He is quite unmoved, appears to enjoy it even, and remains halted 3,000 feet above the plain.

And then three droning silver dragonflies appear, three D.H.9a aeroplanes in formation; a little below us they seem to make the peculiar hovering darting flight of the dragonfly against the rocky background of the mountains. They circle round and drop into the valley out of sight to appear later on the ground, drawn up in line.

The Sheikh decides upon another reconnaissance, so two of his own people—Mustapha Effendi, an interpreter, and Hama "Coulearer," the village baker who is six foot four and muscular—are sent down to Khurmal to make discreet inquiries. We keep them in sight with a pair of binoculars, and later dispatch a boy of the locality to run down and collect their news. It is fully 3,000 feet and very steep, but he runs all the way like a mountain goat, and is back again within twenty minutes.

Their news is disconcerting. The High Commissioner has not arrived, is ill and will not arrive, so a representative is acting for him. This upsets the Sheikh and a council is held to decide whether he should go down. A fatal thing to do, for there is no unity or cohesion, and no one listens to anyone else. Salah's men and some others naturally confuse matters still further. Majid gives up arguing and comes to me and explains. In my then nervous state I am furious; not trust the British, not go down as agreed? "Preposterous, Mahmoud would spoil everything for a half-pennyworth of tar; he must go down and reap what good he can from our return." Perhaps I would care to stay behind as hostage said Majid—he would have his revolver, and if the Sheikh was trapped then he would shoot me. I agree eagerly on the heat of

the moment, anything to stop the Sheikh creating a bad impression at the start of negotiations. And then, beginning to regret it, doubts fill my head. Were the British always fair and "above board"? Supposing it is a trap, suppose the Sheikh fails to obtain anything, might he not return and take me back with him in anger? To my relief the Sheikh sends a message asking for a meeting at the base of the foothills, where his line of retreat is secure.

Mustapha Aga, the guard commander, and Said Achmed, the vizier—an amusing mixture of guile and timidity, and a pleasant fellow to talk to on occasion—are sent down with the message and with Hirst and our baggage as "sweeteners." I wait at the top fuming. In a broiling sun the morning is wasted, there is no movement and no lunch. I curse and revile the Sheikh, and finally, leaving everyone, I sit alone and disconsolate, refusing to shelter from the sun, and afire to move on down into the valley.

At about three o'clock we leave, but although the track is fit for riding I refuse a horse in a tantrum. Just before we arrive in sight of the British, Mahmoud speaks to an interpreter who dismounts and tells me the Sheikh says I must ride—I refuse and exhaust on him and Mahmoud all the English and Kurdish oaths I have ever heard. And so it is a rather disgruntled and irritated gathering that rides ahead of me and around a small knoll.

Walking after them I round the knoll and see a group of horsemen and a line of native infantry drawn up some 300 yards behind them. I walk on towards them, not caring, uncomprehending almost, until I see riding breeches, jodhpores and topees—Englishmen! Suddenly everything is terribly misty and I am gulping hard. "All right, Denny? I just want you to push straight off by air." I mutely shake hands with Mahmoud and some of his people, I am incapable of doing more than prevent a complete breakdown; then I mount a horse and ride in to Khurmal alone. There I meet Embry and Duke, and, after a drink in the Iraq army mess, fly back with them in two of No. 30 Squadron's D.H.9a's. We land at Kurkuk just before sunset where we are met by the squadron and taken to the mess.

* * *

As I "deloused" in a hot bath that night, glorying in the luxuries of freedom and civilization, I wondered what would happen to Mahmoud who had behaved so well to us. However, negotiations failed and he returned to his exile in Persia. And so a very considerate captor once again sacrificed his comfort to nationality and indecision.

PLAIN ENGLISH!

BY SQUADRON-LEADER E. L. HOWARD-WILLIAMS, M.C.

SOME of you may remember Dr. Johnson's famous definition of a net

“ Anything reticulated or decussated, with interstices between the intersections.”

and that the schoolboy preferred

“ Holes with string round them.”

In consequence you might perhaps be tempted to borrow a dictionary of the English language, where you will find that a horse is not a horse at all. On the contrary it is

“ A large perissodactyl ungulate animal, domesticated by man.”

But that is by no means all. There is the story of Plato's definition of a man as

“ A two-legged creature without feathers ”

of which the student Diogenes demonstrated the weakness by appearing at the Academy in triumph with a plucked cockerel.

When, therefore, Dr. Johnson points out that it is often impossible to explain a word in terms less abstruse than itself, and that to define some words satisfactorily we must use words too plain to admit of definition, then we may begin to realize why it is people do not always understand what some of us say or write.

• • •

After civilization and centuries, literary genius has left a legacy with which to describe the wonders we see and some of the things we do. Generations of poets have given us priceless descriptions of our countryside, of graveyards, and of horse-races; in fact our language is in the process of perfection to describe such matters.

But what if we wish to describe our thoughts, our ideas, our ideals? Try to put our sentiment on paper and we find the result may well look stupid. A few written words about that young woman of ours, our man, or our child, whether they be laudatory or merely affectionate abuse, those words will either be incomplete or horrible. Were we to write a full description of our thoughts during one hour of meditation we should be defeated by our vocabulary and by the clock. In five minutes one can imagine enough to defy description. In one minute one can dream enough that no hour could describe, always supposing that to be desirable.

In practice we find that if we wish to pass on what is in our mind, we are limited by the experience of those who hear or read our words. For instance, if we are bold and bad enough to talk to a woman about

poetry and art, with sufficient conviction and abandon, she will do one of two things: she will either gaze into our eyes, open-mouthed and full of admiration, or she will wonder what our intentions are. A woman of experience will probably do both, and might do anything.

The scientist, the inventor, the idealist, the lover, all have something to say, and if they say it their English often becomes appalling. The lover, confronted by the love of his dreams, is either tongue-tied, futile, or both. The scientist, according to Barrie, has most to tell the world and least knows how to set about it because no adequate medium has as yet been developed, except often a costly and difficult demonstration. As an example of this we have the success of Lister and of Ford, who have both proved themselves by their works more than by their words. As a further example we have the exposition of the Prandtl theory by Lanchester, an abstruse theory in aeronautics which in conception is both brilliant and complete, satisfying not only the theory of flight, but leading to exact mathematical formulæ for the complex relationships that exist between lift and drag, chord and span, biplane and monoplane, shape and external interference in air-flow. In 1906 Lanchester propounded this theory but no one understood what he was talking about until Prandtl, a Russian, was able to present the subject after the war in a manner which others could follow.

This leaves us to imagine the limitations imposed by the shortcomings of language on the mathematical and exact sciences, and on the psychological sciences which deal with abstract quantities and are faced with a greater task in consequence.

• • •

I therefore suggest it is just as important for the so-called "practical man" to try to understand the purist, as it is for the latter to explain himself more clearly. It is scarcely sufficient to say

"Damn the fellow. Why can't he say what he has to say in plain language, that anyone can understand."

The answer is that the fellow has probably spent his life among people more or less of his own type, and not among those who can only understand plain words and simple ideas: few men have the ability or the time for both. The purist is as justified when he says

"Dear me. Why cannot he understand what I am trying to tell him."

Admittedly, centuries alone can provide understanding that will enable the pictures framed in the minds of the great thinkers of to-day to be understood by all of us. Therefore, while we may try to use simple words, we should perhaps strive to comprehend more and more the jargon of those who have not the skill of the few who are able to write good plain English, that the meanest among us can understand.

THE SIBERIAN TIGER

BY CAPTAIN W. A. POWELL.

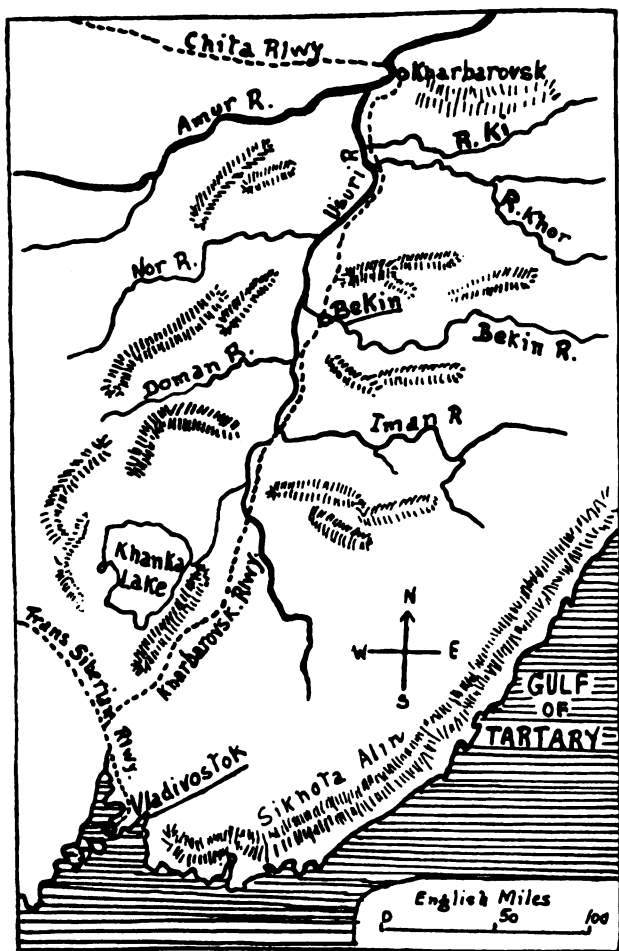
THE tiger has come to be so generally associated with the jungles of India, Burma and Malaya that it may be of interest to recall the fact that its habitat is not restricted solely to those tropical countries but extends through China, Mongolia, Korea and Manchuria into the sub-arctic territory of north-eastern Siberia where, in considerable numbers it hunts the wapiti, sika deer, wild pig and smaller game which frequent the extensive snow-covered swamps and forests of that area. It is also met with in the mountainous region of Lake Baikal. Far from being a migrant from the south to these inhospitable lands, palæontologists say that, some 50,000 years ago, the tiger, the largest species of living carnivora, was indigenous to the then tropical territory of Siberia, and only spread to Southern Asia during a comparatively recent period of the earth's history.

Upon my return to China by the Trans-Siberian Railway, some years ago, I had the good fortune to meet General R. Pigot, who was on leave from India and who subsequently served in the R.F.C. during the Great War. After we had journeyed together for six days he detrained into what seemed an arctic desolation at Krasnoyarsk and set out upon a 300-mile trek by sleigh to the Mongolian Altai to hunt *Ovis Ammon*. At a later date I was fortunate enough to see the remarkably fine collection of heads which he obtained there. Before embarking upon his cheerless journey he persuaded me to accompany him at some future time to the little-known Amur region of N.E. Siberia to hunt the Siberian tiger (*F. tigris Mongolica*), and these notes of our subsequent trip may prove of interest and assistance to other sportsmen who, when Bolshevism has finally run its course, may visit this same district, which we found to contain many interesting varieties of game and plant life. Lying quite off the beaten track it is undoubtedly well worth a visit.

It must be recorded at the outset that although we came to close quarters with these tigers we did not succeed in bagging one of them—I am afraid because we went at the wrong season. Pigot's leave had been postponed, unfortunately, owing to an Indian frontier disturbance and, as a consequence, we were compelled to carry out our project in February when the snowfall was eighteen inches deep. The proper time for such hunting is undoubtedly in November, when the ground is but thinly covered with snow, for then the tigers range over very wide

areas in search of food and keep continually on the move. Hence the depth of snow may be—and in our case probably was—the determining factor between success and failure.

The Siberian peasants have exaggerated ideas of the dimensions which these tigers attain, due, perhaps, to the fact that their fur grows to a length of eight or nine inches and thus increases their apparent



bulk. Judging, however, from the photographs which we examined and the tracks which we followed, this sub-arctic species is certainly slightly, and sometimes, in fact, considerably larger than the average Indian tiger. The fresh tracks of one which we followed were, indeed, of incredible size.

That they are plentiful may be gathered from the fact that, during

the previous winter, four professional hunters, one of whom was mauled and died from his injuries, accounted for no fewer than sixteen of them in the marshes to the North-West of Vladivostock.

To the best of Messrs. Rowland Ward's knowledge, however, no Englishman has ever succeeded in bagging one.

Pigot eventually reached Shanghai in January and after some sight-seeing and shopping we embarked for Vladivostock in the Russian mail-ship *Ryazan*—a vessel boasting unusually sumptuous state-rooms and so liberally subsidized, apparently, that she dispensed altogether with cargo! I may add too, that her open-hearted captain delighted, throughout the voyage, in pressing his wine and other hospitalities upon us. A short stay at Nagasaki to coal ship enabled us to explore the town and to cross the picturesque peninsula to the neighbouring village of Moji. The evidences there of an early spring were in sharp contrast to the frigid conditions encountered forty hours later off the coast of Russian Tartary, where our vessel had to force its way forward to Vladivostock through masses of drift ice. Here, in spite of Consular assistance, we experienced difficulty in clearing our rifles and baggage through the Customs and two days were inevitably wasted. However, we derived some amusement during our enforced detention by studying the idiosyncrasies of the Customs House Staff, one of whom, a uniformed general with many ribbons, appeared to hold the most junior position, a misfortune of which his fellow officials facetiously took every advantage.

Unless conditions have radically changed under the Soviet régime, sportsmen visiting Russian Tartary would be well advised to bring no camp-kit and only the clothes in which they stand. Everything needful for a shooting trip, including even rifles and cameras, may be either purchased or hired quite inexpensively in the town and much trouble and expense saved thereby. My Holland and Holland double .465-bore rifle had not reached Shanghai when we left that port so I gladly accepted the offer made by a generous Russian acquaintance of a magazine weapon of about .370-bore and arranged for my own rifle to be forwarded later by courier. I used also a 12-bore shot-gun, but Pigot relied solely upon a .450-bore rifle.

At the best of times a soulless place, Vladivostock, under its pall of snow, filled us with a sense of despondency, but considerable relief from its chilly discomfort could be had, we found, at the *cafés chantants*, where all the inhabitants foregathered nightly between 10 p.m. and daybreak and, under the stimulating influence of vodka, thawed themselves into cheerfulness. At the local Government store we found a most serviceable assortment of clothing, camp equipment and provisions at bargain prices. We bought a side of beef, a sack of rice, dried fruit, bread, tea, and preserved milk. English gabardine shoot-



A FOREST TRAIL.



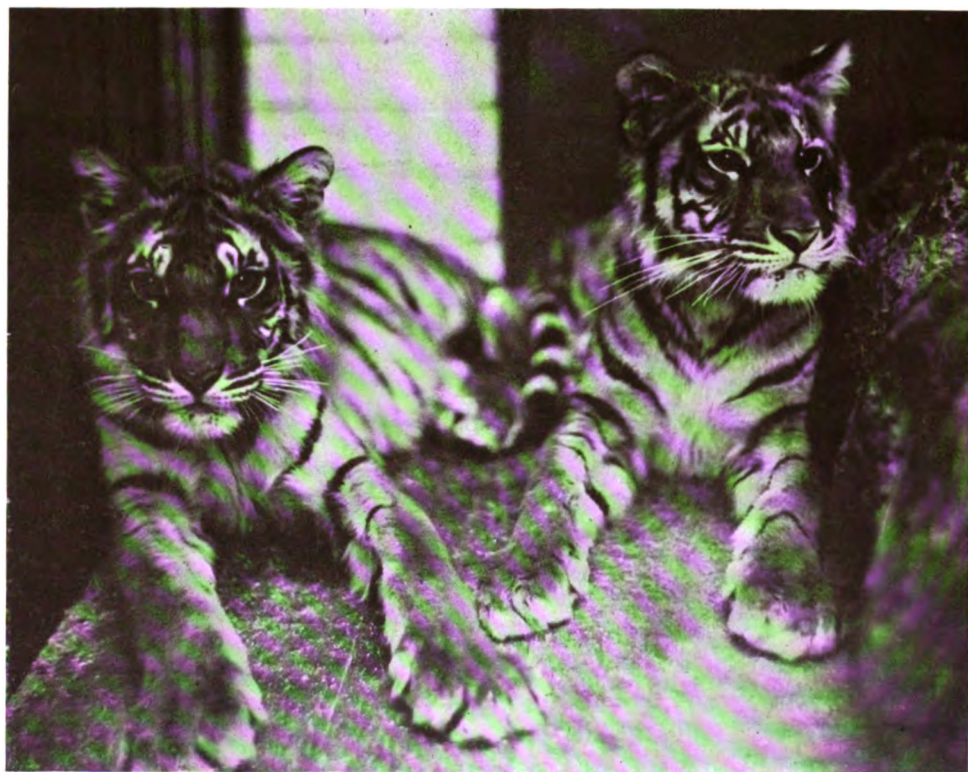
A CAMP IN THE OPEN FOREST.



SIBERIAN TIGER WITH WINTER COAT.



SIBERIAN TIGER WITH SUMMER COAT.



TWO IMMATURE SIBERIAN TIGERS.

ing suits, with boots and puttees, served well enough for marching, but, for sleeping, the fleece-lined corduroy clothing which we obtained in China was indispensable, also the felt top-boots, fur caps and gloves which we purchased locally. I used a sheepskin-lined blanket overcoat, but the wapiti garment, leather-side outermost, which Pigot bought at the store was both lighter and more serviceable.

Through the good offices of the Governor of Vladivostock we were given an introduction to the principal Cossack of the region in which we intended to shoot, and our next itinerary was by the Vladivostock-Kharbarovsk railway to Bekin, the village where that official dwelt. The journey, accomplished by night in four-berth sleeping compartments, shared indiscriminately by men and women, was both slow and uncomfortable owing to the primitive construction of the line, the rails being merely pinned to sleepers laid on a rough track at intervals of about six feet. We brought with us an interpreter, Bahktin, also a Chinese cook, Chu Sing, but we might have saved ourselves this expense for their services turned out to be largely superfluous. The Cossack chief, whose title was Prince, but whose name I have forgotten, welcomed us cordially, and after discussing our project over alternate glasses of his own vodka and our solitary bottle of brandy, detailed four of his subordinate Cossacks to act as our retinue. The ability of these men, Orlov, Dmitri, Nicolai and Ataman (their leader), as hunters and guides was beyond question and the services which they rendered us in general were invaluable. Amongst the varied experiences which they related was a first-hand account of the siege of Port Arthur. They were of the unanimous opinion that, had the Russian armies been properly led, the result of the Russo-Japanese war would have been reversed.

For the twenty days' journey before us a certain amount of preparation was necessary. Ataman had three sleighs only available, so we constructed a fourth, using small birch trees as runners, it being customary, apparently, for villagers to keep in readiness a number of these trees tied into the requisite shape whilst growing. These runners were connected to each other and to the top rails by cross pieces, and the sleigh was then complete—a rather crude contrivance consisting simply of an open framework for the baggage and fodder.

The method commonly practised by trappers in hunting the tiger is to search for fresh tracks on foot and, when they have been found, to follow them up with a pack of dogs, whose business it is to bring the animal to a standstill by baying it and so give the hunter an opportunity of a shot. This being the method favoured by Ataman we selected a pack of eight of the largest and most savage-looking cross-bred Samoyedes which we could find and purchased some sacks of dried fish from the village store as a reserve of food for them. The

temperature stood at 20 degrees below zero Fahrenheit and, heedless of Dmitri's warning, in storing the fish in an outhouse for the night, I allowed my hand to freeze tightly to the iron door-handle and experienced some difficulty and pain in freeing it. Dmitri had previously related for our edification how, when a child had been stunned by a fall from a moving tram in Vladivostock, her lips froze to the rails before help arrived. Eventually, so he said, a knife had to be used to release her. Our introduction that evening to the conditions under which Siberian peasants live was very disagreeable. Vermin in incredible variety abounded everywhere, and the foul atmosphere of the living-room on the floor of which we lay, was suffocating.

In the morning, after mustering our pack of dogs, we harnessed the four Mongolian ponies to the sleighs and set out on the Bekin River, intending to proceed up its frozen course as far as possible before searching the adjoining forest for the tracks of tiger. Fine weather, with practically no snowfall, favoured us throughout the trip. The going being good, the ponies were equal to drawing our additional weight and we made good progress. We avoided some of the larger river bends in the vicinity of Bekin by making short cuts through the forest, but further up-stream the dense undergrowth forced us to keep to its course. That night was spent in comparative comfort at an outlying farm where we found a party of Government surveyors. They took a friendly interest in our plans and assured us that tigers were plentiful in the neighbourhood. Later in the evening, however, one of their number, a man of most unprepossessing appearance, in a fit of drunkenness, and for no other apparent reason, threatened to knife us. After pacifying him, Ataman tactfully induced him to sleep in an adjoining building.

Except for passing the tracks of several wapiti and lynx, the second day proved uneventful, but on the third morning we drew up to examine some tracks—too old to be worth further investigation—of what must have been a very large tiger which had crossed the river to the south. At dusk, about 4 p.m., we halted at a small log cabin, or pit dwelling, for the floor was several feet below ground level, inhabited by about a dozen lumbermen of various nationalities—Chinese, Manchus, Koreans and Buriats. They spent the winter, they informed us, felling timber which they floated down river to the railway at Bekin in Spring. In spite of their kindly efforts to entertain us, we did not relish having to share their communal bedstead, extending down one side of the cabin's single unventilated apartment which served as kitchen, dormitory and living-room, and only by a lavish expenditure of insect powder did we obtain any sleep. We found too that our rifles and camera lenses, on which the overheated atmosphere condensed in the form of frost, had to be cleaned both inside and out, so

on subsequent visits to such dwellings we made a point of leaving those articles outside.

The country on both sides of the Bekin River is undulating woodland. Pines and silver birches were most in evidence, but rarer species such as the cork tree, acacia and walnut—survivors possibly of warmer sub-tropical conditions—were not uncommon. The undergrowth consisted partly of Arctic brambles and whortle-berries with a few wild currant and raspberry bushes.

By the afternoon of the fourth day the river had shrunk in width to about forty feet and the surface had become so rough that upon two occasions a sleigh overturned. We decided, therefore, to proceed no further and prepared to spend our first night in the open. Before doing so, however, we made a short circuit of the forest to try the surface of the snow-covered undergrowth, and found that it was unpleasantly soft. The Cossacks invariably wore loose cowhide moccasins which enabled them to break the trail more easily, and we should have been less tired, perhaps, had we adopted similar footgear, which is both light and warm and does not readily sink into the snow. We found that, in the darkness, under such frigid conditions, it was not easy to occupy ourselves for four hours before turning in at 8 p.m. or thereabouts, and even less so to do this between the waking hour of 4 a.m. and 8 a.m. when the first signs of dawn appeared. Worse still was it in this respect when, separated from the sleighs, we slept in the open forest. On the present occasion, wearing furs and having hay to lie upon, we experienced no great discomfort and kept warm even without a fire, while the hardy Mongolian ponies fed contentedly without shelter of any kind.

The following morning we left Orlov, Bahktin and Chu Sing in charge of the sleighs and, taking with us sufficient food for three days, began our search for tiger. When shooting bears and wapiti, Ataman preferred "still" hunting, he told us, but now, with eight hungry and ill-tempered dogs in our train, silence was obviously out of the question, and many wapiti and other game escaped us which otherwise we might have bagged. During the succeeding three days we examined with interest numerous tracks of animals and birds, none of which our escort were at a loss to identify, indeed in some instances they determined sex and age as well. Lynx, wild pig and sika deer were most plentiful, but upon this and other occasions we observed also the trails of sables, skunks, polecats, foxes, hares, squirrels and wapiti. We saw no traces of wolves or bears. The former are apparently rarely seen so far east and the latter were, of course, hibernating. Shortly after leaving the sleighs, we came upon tracks of two tigers, but as they appeared to be about a day old we ignored them.

Carrying, as we did, but one blanket apiece, it was essential to

provide fuel for a very large fire, so at 3 p.m. we were obliged to halt and fell sufficient timber to last out the night. A bed of pine needles with a lean-to of canvas set up in a hollow cleared of snow completed the work and afforded a more comfortable shelter than might be supposed. The next two days were blank so far as fresh tiger tracks were concerned, but whilst looking round for some dry wood with which to smoke out two sables whose tracks led to a large hollow tree, I discovered the partly eaten carcass of a dog and numerous marks of the tiger which had devoured it.

Returning to the sleighs, we moved up a tributary of the river and found there a hut, empty and, we hoped, free from insects. It contained what appeared to be a rough bed but which was in reality a hen-coop. We drew lots for its possession and Bahktin won, but he hurriedly joined us on the floor an hour or so later when the warmth of his body resuscitated the fleas hibernating in its crevices. Whilst here the Cossacks, using their service rifles for the purpose, bagged several hazel grouse (*Bonasa sylvestris*), which formed a welcome change of diet. By the simple expedient of refilling the brass cartridge cases with small charges of shot, they used those weapons both as shot-guns and rifles! Two days' march from this spot we fell in with a Russian trapper, whose hut was hung with skins of every description. He told us that he had shot many tigers and that he had been badly mauled by one of his victims; the scars on his forehead certainly bore out his story. A single round of his traps occupied him apparently for three days, but we agreed that his was not an unattractive life in spite of its loneliness.

After some further unproductive search, we divided forces and proceeded in opposite directions so as to cover more ground. A few evenings later, at the end of a particularly tedious march, in company with Dmitri and Nicolai, who had remained with me, we came upon a lumberman's cabin, and the occupants told us excitedly that a large tiger, moving in an easterly direction, had passed quite close to them that afternoon. We hastened off to examine its tracks, which we found, true enough, were quite fresh and those of a very large animal indeed. Unfortunately it was nearly dark by this time, so we were obliged to sleep at the cabin and thus give our quarry at least twelve hours' start. These lumbermen, although of Mongol origin, appeared to take but little genuine interest in hunting; we were glad, however, to share their supper, which consisted chiefly of boiled rice sprinkled liberally with vodka, and also to replenish our store of food which we should need in the morning. By sunrise we had already covered several versts and for the whole of that day and the next we followed the tiger, which was heading in the direction of the coast. Exaggerated, perhaps, by the depth of the snow, the tracks appeared to have been made by an

animal of incredible size and it was with no little excitement that we followed them. The first day and night were uneventful, but at noon on the second day we found the fresh remains of a deer, not yet frozen, off which the tiger had evidently fed. It was then, I think, quite close to us, for the dogs thenceforward showed no inclination to lead the way; but we did not succeed in getting a sight of it although we struggled on until dusk and bivouacked in the dark.

Next morning we realized that our chances of overtaking the animal were negligible. Our food was becoming exhausted and we were already about twenty miles from our sleighs; so reluctantly we gave up the chase and trudged wearily back to the river. Shortly afterwards we returned to Bekin, where I learnt that Pigot had likewise followed a tiger at which he had succeeded in getting a shot.

A grim tragedy was enacted on the night following our departure from Bekin, for upon our return to China we learnt from the Consul that Dmitri, whose services were invaluable throughout the trip, had been attacked and killed by a tiger which had awakened him from sleep by entering his farm compound in search of food. We felt that a fate more tragic or ironical than this could hardly be imagined.

Although we had been unfortunate in not gaining our principal objective, owing, I believe, solely to the season at which we went, the journey had been one of singular interest, and if it were undertaken by others during the months of October and November it would, I think, almost certainly be productive of better results than were vouchsafed to us.

AIR NOTES

HOME COMMANDS.

HEADQUARTERS, Coastal Area, moved from London to Lee-on-the-Solent, with effect from January 18th, 1932. Headquarters, No. 10 Group, were disbanded with effect from the same date.

Headquarters, No. 1 Air Defence Group, at present occupying premises at Sloane Square and King's Road, Chelsea, moved on March 7th, 1932, to 33-34, Tavistock Place, which was vacated by Headquarters, Coastal Area, on January 18th, 1932.

Southern Office, A.I.D., which now occupies premises at 3 and 4, Clements Inn, will also be moved to 33-34, Tavistock Place on May 2nd, 1932.

OVERSEAS COMMANDS.

MIDDLE EAST.

British Somaliland—Abyssinian Frontier Survey.

Arrangements have been completed between the British and Ethiopian Governments for the delimitation of the frontier between Abyssinia and the Somaliland Protectorate. As in the previous case of British-Italian Somaliland frontier delimitation, one of the main features of the survey will be the use of aircraft to assist in the task of demarcation by means of aerial photographic work on the boundary in co-operation with the ground survey party. A Royal Air Force officer has been appointed to serve on the British Boundary Commission in the capacity of Technical Assistant. His duties will be to direct the operation of aircraft employed on the survey, to act as connecting link between the Royal Air Force command providing the aircraft and the Chief of the Commission, and generally to advise the Chief of the Commission on the most efficient and economical employment of the aircraft placed at his disposal.

It is proposed to take advantage of this opportunity to test a method of photographic survey which is being developed in order to meet the requirements of the Army, in which the air photography can be completed independently of the progress of the ground party.

Preliminary work in connection with the survey is already in hand, and the Commission is expected to start its labours almost immediately.

East African Cruise, 1932.

Four Fairey IIIF. aircraft from No. 14 (B.) Squadron, Amman, left Heliopolis on January 11th for a cruise in East African territories via Sudan-Kenya-Tanganyika-Uganda.

The programme of the flight has been made elastic in order to allow for visits to be paid to outlying districts in Uganda, Kenya and Tanganyika, many of which have never before been visited by Royal Air Force aircraft. Co-operation has been arranged with local military forces at Entebbe, Nairobi, Meru, Dar-es-Salaam and Tabora, and facilities are being afforded for certain District Commissioners and Provincial Governors to fly over their respective districts.

At the request of the Governor of Kenya, advantage is being taken of the opportunity afforded for an air reconnaissance and occasional photography of the boundary line between Kenya and Italian Somaliland for a distance of approximately 220 miles south of Mandera, in order that the Kenya Government may gain information regarding the condition of boundary marks in a waterless country difficult of access.

CYPRUS.

In connection with the serious civil disturbances in Cyprus in the autumn of 1931, the following incident is of interest as reflecting great credit on the Royal Air Force personnel concerned.

Two airmen, one of whom was a W/T operator, were embarked, with supplies of aircraft stores, W/T equipment and fuel, which were urgently required in Cyprus, in s.s. *El Gharib*, a 400-ton sixty-year-old Italian yacht. The vessel was manned by a Greek captain and a cosmopolitan crew, and should have reached Cyprus within twenty-four hours.

After seventeen hours' steaming, only ninety miles out of 245 had been covered. Some of the crew were ill and all appeared inefficient, only one stoker then being at work. The W/T operator erected his W/T set and reported to Headquarters, Middle East, the reason for delay in arrival of stores at Cyprus.

Land was sighted after forty-eight hours, and, as the captain mistook his position, he would probably have run aground but for the intervention by the Royal Air Force personnel, who obtained the correct position by megaphone from a passing vessel. The entrance to Famagusta Harbour was only made with the assistance of the Royal Air Force personnel, who, in the absence of a Morse lamp, ingeniously provided the necessary signalling apparatus to communicate with H.M.S. *Colombo*, which made the necessary arrangements for piloting and berthing the s.s. *El Gharib*.

It was largely due to the initiative and resource shown by the airmen that the stores referred to reached Cyprus in time to be of use.

SUDAN.

Reconnaissance of Sudan Coast.

Between October 19th and 31st, 1931, a thorough reconnaissance was completed of the Red Sea coast from Hassa Lagoon to Bahdur Island by aircraft from No. 47 (B.) Squadron. For this work three Fairey IIIF. landplanes were flown to Port Sudan, where floats were fitted.

The objects of the reconnaissance were:—

- (1) To test sites already selected as suitable for seaplane anchorages.
- (2) To discover and report on other suitable sites.

The flight also studied the possibilities of using sea-going aircraft in anti-smuggling and gun-running measures in these waters. It also gained experience in the operation of converting a squadron of landplanes to floatplanes at Port Sudan.

The flight was accompanied by the Sudan Government Geologist, and a careful survey of a number of suitable anchorages for flying boats or floatplanes was made. A complete photographic mosaic was taken of Hassa Lagoon and soundings were made at a large number of places in this and other possible sites.

During the reconnaissance two dhows were seen to be unloading cargo on to camels near the Egyptian border. As there was reason to suppose they were smugglers, H.M. sloops were informed, but it is feared that, as the boats were hidden in shallow channels behind reefs, and visible only from the air, they could not easily be located or approached from the sea. The information was also passed on to the Sudan Political Service, who asked that aircraft *en route* between Wadi Halfa and Atbara should assist by reporting any large camel convoy. This short flight gave interesting evidence of the potentialities of aircraft in checking illicit trading on this coast, and it is thought that their use in this work should receive further study.

Reconnaissance to Bir Natrun.

Between November 19th and 22nd, 1931, as the result of an attack on a camel caravan of Dongola Arabs by armed tribesmen, believed to be raiders from Italian Libya, five Fairey IIIF. aircraft of No. 47 (B.) Squadron, two Victoria aircraft of No. 216 (B.T.) Squadron, and a motor machine-gun battery of the Sudan Defence Force, proceeded to El Fasher on reconnaissance, with the object of:—

- (a) collecting detailed information regarding this part of the country;
- (b) finding suitable sites in the vicinity for landing grounds; and
- (c) exploring the feasibility of operating aircraft in that district in co-operation with Sudan Defence Force motor machine-gun batteries.

A reconnaissance westwards from Dongola with aircraft and a motor machine-gun battery in 1930 had failed to find a suitable route, and this attempt was therefore made to penetrate northwards from Dharfur.

Three Fairey IIIF. aircraft worked from an advance landing ground on the Wadi Shau, reconnoitring ahead of the motor machine-gun battery. The two remaining Fairey IIIF. aircraft were based at El Fasher to act as spare aircraft and to supply the advanced landing ground. The two Victoria aircraft were employed to maintain the flight of Fairey IIIFs. at the advanced base.

On November 30th a further flight of Fairey IIIF. aircraft conveying the Chief Staff Officer of the Sudan Defence Force and the Deputy Governor of Kassala Province left Khartoum for El Fasher and the advanced landing ground.

The reconnaissance was concluded on December 12th, and a considerable amount of valuable information regarding the country was collected. Sites for landing grounds were found at Wadi Shau, Bir Natrun and Nukheila, and the aircraft had no difficulty in maintaining contact with the machine-gun battery throughout the reconnaissance.

No raiders were seen, but it was established beyond doubt that Nukheila had recently been occupied. Useful information concerning the route from El Fasher to Nukheila was obtained.

ADEN.

Aden-Cairo Flight.

A flight of four Fairey IIIF. aircraft left Aden on February 9th on a tour along the western coast of the Red Sea to Cairo, returning via Sudan.

Prior arrangements have been made for the flight to land at Massawa, in Italian Eritrea, for refuelling, on both the outward and return journeys. The total mileage covered on this tour is approximately 4,000 miles.

IRAQ.

Raiding in Baradost Area.

In consequence of constant raiding of villages in the Baradost area by Barzan tribesmen, a punitive expedition by a small column of Iraqi Army troops was made on December 9th, 1931, with the object of capturing Shaikh Ahmad, the recalcitrant leader, or, failing that, destroying his house and taking hostages. The engagement proved unsuccessful against the strong opposition encountered, and the Iraqi Army column retired to Billeh with severe casualties, pursued by a number of Barzanis.

On the night of December 9th/10th, tribesmen from Raz Ian crossed the Zab and captured the Alka Police Post, which had been established as a temporary measure. This raid was a direct consequence of the reverse suffered by the Iraqi Army at Barzan, neighbouring tribesmen reacting very quickly to the setback of the Government forces.

It was impracticable for climatic reasons to initiate extensive land operations at that period of the year, and, in order to punish those Barzanis who had actively opposed the Iraqi Army column, and to restore Government prestige in the area, air action was taken against Barzan, Resha and Shaikhan on December 10th, after the usual warnings had been dropped.

Further air action was unnecessary in view of Shaikh Ahmad's apparent willingness to negotiate, but reconnaissances were continued over the district pending the return of captured arms and equipment.

It is reported that the situation in the Barzan district is now much easier, and that, as a result of the measures taken, raiding into Baradost has ceased.

FAR EAST.

Calcutta-Singapore Route.

In connection with the development of the Calcutta-Singapore route, and its improvement in order to enable it to be used by landplanes with a minimum of risk during the monsoon period, it has become essential that the route should be properly reconnoitred and maps of the districts covered corrected and brought up to date, not only with regard to sites suitable for forced landings, but also with regard to dangerous areas for flying in bad weather conditions.

One of the most difficult portions of this route hitherto undeveloped, viz., between Victoria Point and Alor Star, lies within Siamese territory. The Siamese Government were approached with a view to obtaining their co-operation in improving the safety of the route by undertaking a survey of this section. Similar surveys had been undertaken by the Royal Air Force on other portions of the route, and by the Siamese authorities on the northern portions of the main Burma-Malaya air route. The offer was made to the Siamese Government that, if they were unwilling themselves to undertake the task, they should utilize the services and experience of the Royal Air Force in the proposed survey and choice of sites for landing grounds.

The Siamese Government cordially accepted this offer of Royal Air Force co-operation, and survey operations are now in progress.

Events Abroad

UNITED STATES OF AMERICA.

DIRECT FUEL INJECTION FOR AERO ENGINES.

The American Pratt and Whitney Company have developed a system in which the normal carburettor is replaced by a series of fuel pumps, one for each cylinder, by which the fuel is injected direct to the cylinder. A "Hornet" engine, an air-cooled radial, has been fitted with this system, and tests have been conducted with it during the past few months. The engine is stated to have been proved entirely practical, and it has now been fitted in a Boeing air-mail aircraft for extended test under normal operating conditions.—*"Aviation," February, 1932.*

ARMY AIR CORPS—AIRCRAFT PERFORMANCES.

In the annual report of the U.S. Assistant Secretary for War for Aeronautics, fiscal year ended June 30th, 1931, it is stated that new aircraft on order for the Army Air Corps show marked improvement in speed over those types already in service. Fighter aircraft will have a top speed of 214 m.p.h. compared with the 175 m.p.h. of the previous type. An increase of 40 m.p.h. is shown by the observation type, which now attains 182 m.p.h. New bombers are capable of 188 m.p.h., an improvement of some 60 m.p.h., while the attack type has a top speed of 196 m.p.h., which exceeds that of earlier types by 55 m.p.h.—*Press extracts.*

U.S. BUDGET ESTIMATES, FISCAL YEAR 1933.

Army Air Corps.

The Estimates for the year ending June 30th, 1933, under the "direct" heading, amount to \$25½ millions, a decrease of \$6,000,000 on the appropriations for the previous year. This decrease is mainly attributable to reductions of \$4 millions for purchase of new aircraft and equipment, and \$2 millions under maintenance and operation. The research estimate, however, shows an increase of \$½ million.

Naval Air Service.

The "direct" estimate amounts to \$26½ millions, a reduction of approximately \$4½ millions. The vote for purchase of new aircraft and accessories is reduced by \$3 millions, while the contract authorization for the same purpose (to be met in the following Budget) is lower by approximately \$2½ millions. Maintenance and operation estimates show an increase of \$½ million.

The large decreases in the amounts required for aircraft purchases in both the Army and Navy are due to the completion of the five-year expansion programme, necessitating the purchase of replacement aircraft only.—*Press extracts.*

ITALY.

DO-X AIRCRAFT.

The second Do-x aircraft, which has been ordered by Italy, has been completed and has been carrying out test flights from Lake Constance, after which it will be delivered to Italy, where the internal equipment of the aircraft will be completed.

It is difficult to understand what object Italy has had in purchasing these aircraft, as, although it was rumoured that they were to be employed on civil air lines, no such use has so far been made of the first aircraft purchased, although it has now been over six months in Italy.

ROUMANIA.

An account of an interview with General Lazarescu, Inspector-General of Aviation, has recently appeared in the Roumanian Press, which gave an account of the policy which the General is following in an endeavour to make Roumania independent of foreign material. There are two aircraft factories, the State Factory at Brasov and the S.E.T. Factory at Bucharest, both of which have recently been enlarged and modernized, as a result of which they are capable of constructing every type of aircraft, and they already produce a considerable proportion of the total aircraft required.

New types of aircraft of Roumanian design have been produced, which it is hoped will replace those of foreign design which have hitherto either been purchased abroad or manufactured under licence.

It is realized that two factories will be inadequate to meet the growing demand for aviation material, and the policy to be followed is therefore the gradual expansion of the output of the existing factories, and the creation of additional factories when the financial situation permits of this development.

SWEDEN.

ADMINISTRATION OF THE SWEDISH ROYAL AIR FORCE (S.R.A.F.).

The report of the Commission of Inquiry appointed by the Swedish Government early in 1931 to investigate certain questions concerned with the administration of the Swedish Royal Air Force was made public during November. The findings and recommendations of the Commission may be summarized, briefly, as follows:—

(a) *The Higher Command.* The Commission considered that the old administration was unsuitable and found General Amundson (Chief of the S.R.A.F.) guilty of incompetence: further, they charged Commodore Lübeck, his Chief of Staff, with accepting bribes, and therefore recommended that both these officers be dismissed the Air Force. In addition, the dismissal of Colonel Fogman (Head of the Military Bureau) and Chief Engineer Fjällbäck (Head of the Technical Bureau) was also recommended, and it was considered that severe censure should be directed against Captain Flory, the Director of the Central Flying School at Ljungbyhed. (All these officers have since been relieved of their posts.)

(b) *Flying Training.* The Commission had under consideration the accident in which Captain Lundborg lost his life in January, 1931

(it was mainly through this accident, which brought to a head public dissatisfaction with the S.R.A.F., that the Commission was appointed), as also the many other accidents which had occurred both before and after Lundborg's death. The Commission were of the opinion that all seemed to point to incompetence, carelessness or insufficient training, and, as stated above, considered that severe censure should be directed against Captain Flory, the Director of the Central Flying School at Ljungbyhed. The Commission recommended the appointment of a special Accident Committee, the members of which to be appointed by the King, and to hold office for one year at a time.

(c) *Purchase of Material.* The purchase of material was also considered by the Commission, who were of the opinion that the policy of the Air Board in this matter had been "planless." Although the task of the Air Board to fulfil the increasing demands made upon it had been admittedly a difficult one owing to shortage of funds, they had nevertheless, it appeared, bought only for the moment and not with a view to future requirements. Seven chapters of the report are devoted to discussion and criticism of the arrangements made by the Air Board for the purchase of "material" of various categories.

The report concludes by stating that the grant to the Air Board had been insufficient and sometimes even incalculable, and that this was the cause of the "planlessness" of the purchasing system. The Staff of the Board was too small and lacked method in its work. The Air Force as an arm could not immediately function without disturbances. Disagreements had arisen in the administration of the Air Force which developed into a veritable intrigue and prevented the proper working of the service.

JAPAN.

Japan has recently carried out experimental tests in connection with the supply of fuel to aircraft during flight.

The supply aircraft, after reaching a height of 3,000 feet, connected a hose with two other aircraft, and certain supplies were made by this method.

The experiment fell short of expected success, but further experimental tests will be carried out.

LONG-DISTANCE FLIGHTS.

With a view of Japanese participation in long-distance record flights, an aircraft has recently been designed in Japan that will fly for seventy hours and cover 7,500 miles. It is hoped by challenging the existing records to obtain a larger measure of public interest in Japanese aviation development.

JAPAN-FORMOSA AIR SERVICE.

A Dornier Wahl floatplane of the Japan Air Transport Company successfully completed a flight between Fukuoka (Japan) and Tansua (Formosa), a distance of 800 miles, on October 4th, 1931, in nine and a half hours. This is the second test flight prior to the operation of a regular Japan-Formosa Air Service.

Extracts from the Foreign Press

EXTRACT FROM THE FRENCH PRESS.

(*L'Illustration*, September 12th, 1931.)

"GENERAL WARFARE AND AVIATION."

By CAMILLE ROUGERON.

There can be no possible doubt but that wars of the future will mean "General Warfare." Mobilization of everybody, "irrespective of age or sex," was agreed to almost unanimously by the French Chamber, and ways and means are now being discussed. In any case, it is quite certain that all possible material resources will be called upon as in the last war, and possibly even more intensively.

Such a conception of war is bound to exert its influence on the principles governing the conduct of operations.

Up till now the destruction of the adversary's "organized forces" has justly been considered the only legitimate means of attaining the required end, greatly to the benefit of persons and wealth not directly involved in the operations. This rule of action had become a moral principle; belligerents could rely on each other for the protection of non-combatant persons and property—humanity and a sense of duty were unanimous in condemning massacre and needless destruction.

But how can such principles be applied to this new conception of general warfare? The destruction of "organized forces" has no limit if all the available resources of a nation are involved in the struggle. Just as our ancestors in the French Revolution made the old people collect saltpetre from the walls of their cellars whilst the children prepared lint, so we to-day shall expect every village blacksmith to make shells, whilst his neighbour, the carpenter, makes airscrews. Children and old people, blacksmith and carpenter, therefore become military objectives. General destruction is induced and at the same time justified by general warfare; the only point which remains still to be discussed is the cost and order of these destructions.

These considerations would be of a merely theoretical value if, at the very moment when ideas on warfare are thus changing, aviation had not supplied the means whereby they may be put into practice. Both useful and fully justified, general destruction becomes possible. That unfortunate state of equilibrium to which the most efficiently conducted military operations were fast heading had been eliminated by this same means. It has, indeed, justly been remarked that the progress of armament has increased the efficiency of defensive measures. Offensive measures, formerly a decisive factor of success, still retain their value against badly equipped armies. But on the Western Front in 1918, between equally matched combatants, the victorious armies required an immense superiority of resources. Without the air arm, it would become increasingly probable that, with two fairly evenly matched adversaries, the weaker would be perfectly well able to hold out against the stronger, provided it had a stabilized front.

The air arm has provided the solution to such a possible deadlock. The most solidly held land front will no longer be able to defend the country behind the lines from which it draws its supplies, and the

collapse of the one will quickly follow the destruction of the other. The mere fact that one of the combatants may be supposed to have gained air supremacy is not always sufficient to protect it from being bombed by its weaker adversary, which may have the choice of time and place. So much the more a country which is unable to claim air supremacy must submit to destruction, and content itself with retaliating as far as its means allow.

We propose to show that, if, instead of employing the air arm merely as an auxiliary arm, the greater part of those resources which modern nations will henceforth call upon in war-time were devoted to it, whilst the Navy and the Army played a purely defensive rôle, the total destruction of the enemy might in many cases be achieved from the air. The bombing of large areas from the air carried out at high altitudes at night or in cloudy weather, is less risky for the bomber than an artillery bombardment; it becomes no longer an operation of war, but a mere question of transport.

The Great War cost France about three hundred thousand million francs (gold), which is approximately the figure at which the riches of France were valued in 1914.

This increase in expenditure is enormous compared with that for other hostilities in which France has been involved of late years. If the increase were to continue at this rate it would be quite impossible to find a basis for reckoning the cost of war in the future, but it is hardly likely that expenditure can increase to any great extent. The means for raising money at the disposal of modern States, namely, requisition, taxes, forced loans, etc., enable them to collect into the State coffers the private wealth of the nation. The difficulty begins when it becomes necessary to collect further money, that is, not only to make use of the money already acquired, but to pledge what can be saved in the future. The last war is too recent for any Frenchman or foreigner to cherish many illusions about the value of the financial commitments of a State engaged in hostilities. The possibility of pledging future savings disappears; the question to-day is which country will be the first to come to an end of those resources which it feels almost certain of not being able to reserve for the future.

It may, therefore, be assumed that each country will use, for the expenses of war, *resources approximately equivalent to the wealth of its citizens.*

This conclusion, which is admittedly a rough approximation, enables us to formulate the rules which govern the economics of destruction.

Let us consider the case of two equally rich nations at war, both possessing equally good strategical positions, who have reached a stalemate in operations on land and sea. One of them arrives at the conclusion that every thousand million francs spent in air raids against the enemy destroys double that value. Therefore, if the first nation continues these attacks in rapid enough sequence it will quickly win the war.

Thus between adversaries who are equally matched in wealth, any form of destruction is worth the money spent on it, provided it costs less than the value of the objective which it destroys.

Between two adversaries of unequal resources, one of which is, for example, four times richer than the other, the first could safely undertake destructive operations once their cost is less than four times the

value of the objective destroyed. The second could advantageously commence destructive operations, provided the cost is less than a quarter of the value of the objective destroyed.

Between adversaries of unequal resources the cost-limit of advantageous destruction varies according to the square of their relative wealth.

Between adversaries of equal wealth, but different as regards the size of the country, the advantage lies with the larger country, not merely because the cost of destruction is a function of the area to be destroyed and not of the wealth destroyed, but also because the useful load decreases rapidly according to the distance to be covered for bombing. It is useless to try to formulate a complicated general rule, but it may quite simply be noted that between adversaries equally matched as regards resources, but different in size, the advantage for the bigger country increases more quickly than the actual size. The example given below will show this advantage.

So far we have assumed that the progressive destruction of the belligerents left their powers of destruction intact, or at least that these decreased similarly as a function of time. This is obviously a false hypothesis, for the powers of destruction of the strongest belligerent, whether on account of his wealth or size, decreases more slowly than the powers of his adversary. The belligerent who holds the best position sees his advantage increase in proportion as victory draws near.

The above examples are not necessary in order to prove that the destruction of a city such as London or Paris is worth while from the military point of view, or that, conversely, the bombardment of the Sahara would not be justified. These examples, however, are useful in fixing the limit of profitable destruction; in particular, they prove that the density of riches in Western Europe justifies the systematic destruction, for military ends, of very widespread areas.

For want of experience, it is not known whether chemical warfare, explosive or incendiary bombs are the most effective methods of destruction. It would not appear that chemical warfare can have the lasting effect on material that explosive or incendiary bombs have. The effect of the incendiary bomb, which is very great in certain thickly populated areas, decreases rapidly outside such areas. The effect of the explosive bomb is more constant, and if the relative cheapness of the latter is taken into account (an essential point in the possibilities of destruction) it may be assumed that for general material destruction the chief weapon used will be the explosive bomb, although incendiary bombs may be used as auxiliary measures for certain inhabited areas and a few poison-gas bombs for disabling the inhabitants.

For want of experience also—and it is inconceivable that nations spending millions on their war budget should not experiment more thoroughly—neither the greatest individual weight of bombs used, nor the extent of the damage caused, nor the proper and necessary division of weight between the explosive and the case is known. Most writers are agreed that a bomb weighing 1,800 kilos, loaded with 1,000 kilos of explosive, destroys all buildings, not of specially reinforced construction, within a radius of 50 metres.

It is probable, however, that the individual weight of 1,800 kilos is not really the maximum weight, and more fully charged bombs fitted with instantaneous fuses would be more effective. However that may be, we

will consider a density of 2,000 kilos of bombs to the hectare sufficient for the objective to be attained.

The cost of destruction by air raids depends largely upon the distance to be traversed before reaching the objective. Working on a basis of the material at present in use—an aeroplane costing 600,000 francs, written off in two hundred hours, with a useful load of 2,300 kilos (bombs plus fuel)—we find that a ton of bombs costing 10,000 francs would come to 13,000 francs if carried a distance of 150 kilometres and to 30,000 francs if carried 600 kilometres. The wealth of many Central European countries amounts to 50,000 to 100,000 francs per hectare; these are, therefore, objectives worth bombing.

Let us take as an example a highly improbable case, which cannot create any ill-feeling. Germany, wishing to rebuild her colonial empire, fixes her choice upon the Sunda Isles and proposes to force Holland to cede these islands by means of a general bombardment. The average distance of the objective from the starting bases does not exceed 150 kilometres. At a rate of 26,000 francs to the hectare, the destruction of the 30,000 square kilometres which constitute the total area of the Netherlands would cost seventy-eight thousand million francs. Such an undertaking would be possible at any moment; the last war cost France twenty times that amount.

Supposing that Holland should wish to offer opposition employing the same measures. The destruction of Germany at an average distance of 500 kilometres would cost 3,000 thousand million francs. This operation would be impossible.

From a financial point of view, therefore, there is nothing to prevent the total destruction of many countries. But how long would the operation last? It is generally admitted that a great Power with 2,000 aeroplanes in commission in peace-time could increase that number five times in war-time. With the hypothesis already formulated, and reckoning on two raids per day, the operation in question would take five months.

All the above hypotheses tend to exaggerate the difficulties. The improvement of aeroplanes in commission will mean a decrease in the cost per ton/kilometre. The mixture of metal and explosive which goes to the make-up of a bomb may be had, with mass production, for less than 10 francs a kilo. It is possible to substitute so-called "liquid-air" bombs for the usual kind in short-distance bombardments, and this is another advantage to the credit of larger countries. The cost of aeroplanes, which has been quoted for those produced in small series, may be lowered by production in large series. Finally, and above all, decisive results may be obtained in limiting the operations to a smaller zone. In the example quoted, it would be quite unnecessary to bombard Limburg or any other purely agricultural district.

Thus the air arm is the decisive factor in the great modern industrial countries, which until now has always been lacking in the most powerful military organizations. It is to-day no longer possible to conceive Holland holding France and England, allied, at bay; the Prussia of Frederick II victorious by land over the rest of Continental Europe; or this same Europe, under Napoleon, unable to conquer England.

It is necessary to go somewhat more carefully into the details of such a roughly devised "mechanism" of total warfare. To calculate the wealth of a country is merely to express an already established fact in

figures. The difficulty begins when one goes into detail. There has been much criticism of those economists who predicted that the war must be of short duration, in 1914, because of lack of funds. They failed to realize that houses in the Avenue de l'Opéra might be put to uses to which they had never been put before, and that it is not the sum of actual wealth which determines the fighting powers of country, but the actual resources which may be called upon and which vary considerably from one country to another.

The same conclusion is arrived at if revenue is substituted for capital, without being justified in the same way, for war means above all consumption of capital. Deprive sixty million men of their ham and their beer and you will raise enough money for your war.

What would be the gain if the same operation were carried out in a country where the people live on three olives and a glass of water? A country's power of destruction is a direct function of its powers of consumption, based on its power of restraint.

Thus the actual wealth which can be called upon in war-time is not the total wealth, but the available resources, and this law is far more to the disadvantage of poor countries than can be judged by a mere comparison of the total wealth of the various countries.

The generally accepted laws on the effect of the wealth and size of States upon their power of destruction and their vulnerability, essentially suppose an equal distribution of this wealth. The vulnerability of Algeria is the same, whatever the area of the Sahara attached to it for administrative purposes.

Until charts showing the riches of various countries are published, maps showing the density of the populations, which corresponds fairly closely to the mobilizable wealth, may very well be used for comparison. This would show how rough-and-ready a method it would be to make comparison according to mere average densities in relation to the whole territory, and also how fortunate France is in this respect compared with various neighbouring countries. It is not merely because the average density of the population of France does not exceed seventy-five inhabitants to the square kilometre, in comparison with countries whose density of population is twice or four times that figure, that France may deem herself lucky. It is chiefly because these inhabitants and their wealth are fairly evenly distributed over the whole territory and that there are very few entirely uninhabited areas. In the richest provinces of the Po Valley the density is as much as 500 inhabitants per square kilometre, in the industrial counties of England 800, and 1,000 in the Ruhr. The really industrial districts, without which resistance would be impossible, take up an area much less than that of the Netherlands, in each of these three countries.

Certain inaccurate ideas regarding the vulnerability of large towns must be put right. The idea that these towns are at the mercy of a surprise raid by enemy aircraft is too common a one amongst the public. Let us refer to the example already given and suppose that Holland, wishing to forestall the operations aimed against her, suddenly tries to wipe out Berlin. Let us assume that she has a peace-time fleet of 300 aeroplanes; according to the hypotheses which have been used for these calculations, one raid would enable the Dutch machines to destroy 2.5 square kilometres, which is not one-fortieth part of the total area of Berlin. Thus the destruction of a large capital such as Paris,

London or Berlin, and the surrounding suburbs cannot be carried out in one operation. Although the desired result would ultimately be achieved, it would require more time and the use of methods which could not be put into operation at the opening of hostilities. Surprise attacks can only be successful against more concentrated objectives, such as a fleet lying at anchor in a narrow roadstead.

The air arm is therefore not merely a chance weapon in the hands of those countries who rely on it, but a sure and reliable one.

The size of large modern towns is often inaccurately appreciated. Thickly inhabited areas, differing, both from the hygienic and military point of view, as widely as a Dutch garden city and one of those Mediterranean towns of which the old quarters of Marseilles and Toulon are an example, are too often confused under this name. There are garden cities or suburbs with less than 5,000 inhabitants to the square kilometre; Paris, "within the walls," has not more than 25,000 inhabitants per square kilometre; the old city quarters reach 250,000 inhabitants per square kilometre. It is only against these latter that surprise attacks are to be feared on account of the age of the buildings and the danger of fire. This is another disadvantage of poor countries.

Too much has been said about ending warfare on account of its increasing horrors for us to base much hope on this subject as regards general warfare. Moreover, the relative mildness of the wars of the past two centuries has made us soft. But, during certain barbarian invasions of the Roman Empire or certain wars in Germany, the belligerents displayed a power of destruction, the scope and efficiency of which will never be attained by aviation.

The new element which general warfare introduces is not this power of destruction, but its cost. The Roman Empire collapsed before a number of barbaric tribes who were victorious through their mere savagery, but in the future such methods will no longer prevail, and victory will rest with those industrial countries with the ability to produce special weapons. The advent of general warfare will deprive uncivilized countries of their sole national occupation. The task of the conqueror who must patiently promote industry, commerce and agriculture, instead of reaping these as the fruits of victory, becomes difficult indeed.

Not having sufficient resources to attempt an attack on another country, poor countries have not even the means of protecting themselves adequately against attack. Industrial decentralization is a luxury beyond the limit of all possible economies; the rebuilding of towns is another. Many countries, were they to devote their resources to such an undertaking, would not be able to provide their citizens with housing conditions such as those in Holland or America.

Therefore, through the medium of general warfare, aviation introduces into the modern world an element of stability which is not to be despised.

(*Les Ailes*, No. 544, November 19th, 1931.)

"THE AIR SCHOOL—SOMETHING NEW AT VERSAILLES."

By LOUIS CORBIN.

Up to the present nothing definite seems to have been settled about the enlargement of Versailles and the installation of the Air School at

Villacoublay. Such a scheme, as soon as it was examined more thoroughly, seemed to present many difficulties, so that to-day things are just where they were a year ago in this matter.

It is high time, however, that something definite should be done. M. Etienne Riché, Under-Secretary of State for Air, has done what he could by making important alterations at the Versailles School.

Henceforward pupils will do two years at the school, instead of eighteen months. At the end of the first year's instruction they will take their pilot's certificates, and will then return to Versailles before leaving to make a general tour of the specializing schools. After this they join their regiments.

Finally, and this is the most important point of all, the Versailles programme has been altered slightly. The time devoted to theory has been reduced, and the time saved given up to flying exercises, which will be much more numerous and frequent. M. Etienne Riché has done good work in altering the programmes, and France should be grateful to him for carrying out necessary reforms.

Thanks to him, France may yet have a flying school where the actual flying is not considered a secondary part of the training, and where practical instruction will replace hours spent in the lecture room in front of a blackboard.

The effect of this alteration made itself felt from the very first month in the training of the pupils, since they have now about twelve hours' flying as against barely one and half at the same period of the preceding year. This extra time has been taken chiefly from the programme of the technical school. Formerly the pupils put in more than 300 hours' work on purely technical subjects. The author is fully aware of the importance of technical study, but 300 hours in a year's course was too much, and meant the sacrifice of other studies.

Also it is quite certain that these courses were beyond most of the pupils who were not sufficiently well up in science. By raising the school-leaving age of the pupils, they arrive at Versailles, having done two year's courses at the Polytechnic or Saint-Cyr. These courses are excellent from the point of view of general instruction, but they are no use at all from the point of view of the professional training of a flying officer.

The whole course of instruction for a flying officer thus comes to four years, divided up as follows: two years' general instruction, and two years' special professional training. It is essential that this time should be reduced. The only possible way to do this is by completely re-organizing the methods of recruiting; in other words, by establishing an Air School.

There remain two changes which meet two different purposes. Pupils will no longer wait until the end of the course to fly, but will fly during their instruction. The author would have liked their instruction to *begin* by flying, but probably the seasons would not make this a practicable plan, as pupils could certainly not fly enough in winter to take their certificates. It would be interesting to know the importance attached to actual flying in relation to the other subjects taught. Are marks given as for the other subjects, and, if so, what?

This point, which may appear unimportant, is, on the contrary, essential. It is absolutely necessary that a good flying officer should be a

good pilot. It is necessary, therefore, that the Versailles passing-out examination should include pilotage tests and marks given for these.

Probably this has not been arranged, but it is to be hoped that Colonel Duseigneur, the new Commandant at Versailles, will give pilotage its proper place in a flying school.

The last change is that which makes it compulsory for all pupils to be proficient in intelligence and reconnaissance work. Formerly pupils were allowed to choose the class in which they wished to specialize—fighter, reconnaissance work, or bombing—after their flying instruction; that is to say, after their period at the school, and according to their place on passing out.

Henceforward all pupils will be thoroughly trained in intelligence and reconnaissance work before leaving the school. Moreover, all will be *obliged* to join reconnaissance regiments, where they will do two years' service before they are allowed to enter fighter or night bombing regiments.

This means, in other words, that at present the instruction of a flying officer is not considered complete until he has done two years as pilot of a two-seater reconnaissance machine and two years' army co-operation service. Whether this judgment is wise or not only the future can show.

In any case, it seems a wise step to allow young officers to gain more experience before putting them in charge of fighter patrols or a section of heavy bombers, for these commands call for great initiative, discipline and control in the commanding officer. The author, without meaning to infer anything against the young officers of to-day, is of the opinion that such qualities are rare in men of twenty to twenty-two years of age.

Nothing but good can result from the plan of allowing young officers two more years in which to gain practical experience by direct contact with N.C.Os. and other ranks, instead of the mere theoretical knowledge learnt at Versailles.

* * *

The following extract from the French Press contains sections of a report upon a flight from Paris to Peking by Vicomte de Sibour. It is of particular interest as coming from one who has flown over Russian territory:—

“REFUELLING FACILITIES.”

As far as Russia refuelling presents no difficulties. In Russia petrol is supplied in 100-kg. barrels, and oil in 20-kg. cans. All calculations are in kilogrammes. The density of the petrol varies around 710 (sometimes 810). A mixture of benzole petrol can be obtained west of Moscow, but beyond Moscow the density is 710 or 810. The Russian Government would, on request, establish depots, if other fuels were required. As regards oil, the “Gargoyle A.A.C.” mineral oil which I used was excellent. It appears that small quantities of castor oil can also be obtained practically everywhere; I can give no opinion as to its quality. Refuelling usually takes some time; assistance is given, but without any hurry. Petrol (keressence) and stiff lubricant is available everywhere.

Route to be followed and general information.

The Russians are making enormous progress in aviation. The aerodromes, although small on the whole, are good and have free approaches.

There is actually only one railway line which can be followed across this immense country, namely, the Trans-Siberian. As regards other routes, the maps are for the most part inaccurate, and not to be trusted.

The meteorological service supplies information as to weather conditions, the direction of the surface wind, and visibility. Before taking off from any place, the aerodrome manager gives a summary of this information, which is supplied by all aerodromes at his request. About one and a quarter hours are required to obtain reports over a distance of 1,000 kilometres. Upper wind reports and weather forecasts are unknown. At certain aerodromes the conventional ground signals are displayed. A white triangle signifies fine weather ahead, and that flight may be continued. A white "H" signifies, on the contrary, that the weather is bad, and that flight should not be continued. A long white panel signifies that no information is available.

The Russians are organizing a passenger line between Moscow and Irkutsk. The big centres such as Omsk, Novo-Sibirsk, and Krasnoyarsk are, or will be, provided with night-lighting and markings. The intermediary landing grounds are marked by a circle with a dot in the centre. The angles are marked as in France; in addition, any areas which are dangerous or in a bad state (these exist even on the aerodromes) are marked with a white cross. At Moscow there is a wide corridor in the centre of the aerodrome, inside which all aircraft must taxi, both after landing and before taking-off. Aircraft must land on the right-hand side and take off on the left-hand side of the corridor (facing up-wind).

Scarcely any hangars are to be found outside the big towns such as Smolensk, Moscow, Omsk, Irkutsk and Chita, and stakes and rope should be carried. As the dew is very heavy at night, it would be as well to have a cover for the engine. Owing to the variations in temperature, the state of the tyres should be watched; they should not be inflated too much and should be protected from heat. A guard is always left with the aeroplane at night in Russia, but it is unnecessary; in China, however, care must be taken to have several guards. At the Russian aerodromes there is always a starter with a red flag (wait) and a white flag (take off). Aircraft must taxi up to him and wait for his signal. Beyond Irkutsk the air route is only used for air-mail services. The aerodromes are much farther apart.

There are no aerodromes in the North of China, but the ground is suitable for emergency landings. There is no meteorological organization. Petrol (Russian or Shell), which is not too dear, can be obtained at certain points. Only automobile oil can be obtained. There are no difficulties in refuelling at the big towns.

* * *

The following extracts from the Continental Press are indicative of two interesting developments in Soviet aviation:—

AIR DEFENCE MANŒUVRES IN LENINGRAD.

WARSAW, 16/9/31.

The Polish newspapers report that recently in Leningrad air defence services have been tested.

An attack with gas bombs on the town by "enemy air force" was carried out. The "enemy's" approach was announced by gun-fire

from the Petropavlovsk Fortress (in centre of Leningrad) and the factory sirens.

On the signal, all traffic in the town was stopped and the people took cover in "passages," etc.

The "enemy" air force was met by Russian machines, which tried to screen all important strategical places by smoke screens. At night the electric power was cut off. These manœuvres have started amongst the Leningrad population many rumours of the "coming war danger."

* * *

LARGE AERODROME FOR MOSCOW. MOST MODERN IN EUROPE.

Moscow, 21st Sept., 1931.

Tass.

On fourteenth anniversary of the October revolution a large aerodrome will be opened in Moscow, which, no doubt, will belong to the largest and most completely equipped aerodromes in Europe.

The new aerodrome covers an area of about 100 "hectars" and there will be all modern equipment like high-power light signal towers (night) and other equipments for signalling. The station building will be 700 feet in length with several restaurants, post and telegraph and pilots' rooms. The flying port will be equipped with hotels for passengers, apartments for 100 pilots and servants. On the ground of the flying port there are also steel hangars, a garage for forty motor-cars, and workshops.

In 1932, one machine per seven minutes will leave this 'drome daily. The arrivals will total at least 100 daily and departures also 100 machines daily.

EXTRACT FROM THE ITALIAN PRESS.

(*Rivista Aeronautica*, No. 10, October, 1931.)

"SOME RESULTS OF THE 1931 ITALIAN AIR MANŒUVRES."

BY GENERAL B. A. FRANCESCO PRICOLO.

The personnel of the Italian Air Force is already certain that the Air Force will be the principal and decisive factor in all future wars. They have still, however, to convince the other services and the nation of this, and it is considered that the results of the manœuvres will have gone a long way towards impressing upon all minds the fact that the best method of ensuring the security of the country is to create a powerful air force, even if this involves reducing the other two services.

In order to appreciate fully the results of the manœuvres it is necessary to understand Italy's doctrine of air warfare. This is that, in order to secure decisive results, aircraft must be employed in mass attacks on a few vital objectives.

One of the main criticisms made about the employment of aircraft in large masses flying in close formation during the manœuvres was that they would form an easy target for anti-aircraft fire. The author, however, states that, although close formations must be adhered to for

mutual support, the effect of anti-aircraft fire can be minimized to a great extent by flying high, and recommends a minimum altitude of 12,000 feet.

Over this height anti-aircraft fire will be an inconvenience, but will not materially affect the result of any operations.

Another important result of the manœuvres was the proof which they afforded of the value of having numerous air bases from which the air force could operate, which enabled the air forces employed to be transferred from one area to another as required, and concentrated rapidly against whichever objective was the most important at the time.

All Italian cities, and particularly those in the North, are open to air attack, and neither the Alps nor the Apennines, nor any defensive measures which can be taken, are of much value against massed air attacks. The only way by which these cities can be adequately defended is by the creation of a powerful air force, at least equal in numbers and offensive power to the air forces of any possible enemies, which will be capable of undertaking a strong air offensive against vital objectives of the enemy. The constant menace of these attacks will be the best defence of Italian territory, and not the methodical destruction of the opposing air force.

Anti-aircraft defences and fighter aircraft should, however, be provided for the protection of the more important centres, in order to defend the population as far as possible against air raids, which it is impossible to prevent entirely, and to make the task of the attacker more difficult.

The author considers, however, that the only effective means of protecting the population of large cities from air attack is to evacuate them. Italy is fortunate in that she has no huge metropolis and that it should be comparatively easy to spread the population from the larger cities over the numerous less important centres. This is a problem which is now under consideration in the Italian Air Ministry.

Nothing can now alter the fact that powerful air forces have become a potent factor in international relations, and that any nation which, through lack of understanding of the potentialities of air power, allows itself to be placed in a position of inferiority will find itself at a serious disadvantage in war.

The author concludes by estimating that an air force of at least 9,000 aircraft, 2,000 of which must be first-line aircraft, is the minimum strength required to enable an air force to exercise a decisive influence in war, and that an air force of this size should therefore be maintained in peace.

EXTRACT FROM THE ITALIAN PRESS.

(*Rivista Aeronautica*, No. 11, November, 1931.)

"THE OFFENSIVE FIGHTER AEROPLANE."

BY CARLO GENZINI.

The author first explains what he means by an *offensive fighter aeroplane*.

At present all fighter aeroplanes are armed with forward machine guns which, in almost all machines, are synchronized with the airscrew.

With this arrangement of the machine guns the fighter can only attack the enemy aeroplane from the rear, flying almost in its wake, hence its own method of defence must be a continual attack on the enemy.

This is practicable if, in case of inferiority, the fighter is powerful enough to get away and reach the safety of an allied landing ground. But when, through force of circumstances, the fighter has to penetrate into enemy territory, in order to carry out rapid reconnaissance or to take photographs, for example, or to observe the movements of enemy troops, and fire on them if necessary, or else to convoy and defend bomber aeroplanes which have to penetrate some hundreds of kilometres into enemy territory, the conditions are entirely changed.

The enemy fighters will attack.

The fighters will find themselves surrounded by a number of enemies all trying to bring them down. The pilots will manœuvre to escape the enemy's attacks, and attack in their turn to rid themselves of the enemy, but only within certain limits which are determined by various conditions.

At a given moment, the fighter pilot will find that he has only enough petrol to reach allied territory, that he has run out of ammunition, that the machine gun is hopelessly jammed, or else that the enemy pilots are so many or so skilful that he must either get away or be hit and brought down. This means that he must break off the fight and get away.

But how?

Below, enemy territory extends for many minutes or even hours of flight, the enemy follow in the rear in greatly superior strength.

The fighter is disarmed, or at any rate incapable of defending itself; the enemy, with the advantage of being within their own territory, are in the best position for firing with their forward machine guns.

In order to escape, the fighter would need to be much faster than the enemy aeroplanes, but in these days there is little difference between machines.

Hence, its fate is in the hands of destiny. If the enemy exhaust all their ammunition without hitting it, it may, if all goes well, reach allied territory, otherwise it can only land in enemy territory and surrender, before it is hit in flight.

This shows that the present fighter, armed only with forward machine guns, is merely a defensive aeroplane, for use almost exclusively in its own territory for defence against attack by enemy reconnaissance or bomber aeroplanes.

The author calls aeroplanes armed only with forward machine guns *defensive fighter aeroplanes*, since they only serve to defend their own territory, without being able to attack the enemy territory.

How, then, is it possible to produce an *offensive fighter aeroplane* capable of carrying out missions over enemy territory, and able to defend itself against the attacks of enemy fighters?

This is simple; the undefended points of the fighter must be armed with weapons which have as accurate an aim as the forward machine guns.

To this end, tests have been carried out on a fighter armed with a machine gun in the rear as well, with the same facility of manœuvre and aim as the forward machine gun.

The chief difficulty lay in the aiming and sighting.

Hence tests were also carried out with reflector sights, which give a

greater simplicity and accuracy of aim than the forward sights installed in the present fighter aeroplanes.

In addition, these sights serve a double purpose, for they also allow of forward vision merely by changing the position of part of the sights, whose only function is to bring the field to the rear of the pilot into the sighting quadrant.

The direction of aim is given by a luminous point reflected in the sighting quadrant.

The aiming point is surrounded by three luminous concentric circles which enclose a visual field, which, for a distance of 200 metres, is:

2	metres	for the circle of smallest diameter.
4	"	" " " " " " " " " " " "
8	"	" " " " " " " " " " " "

The sighting quadrant covers a rear field of 35 metres, always for a distance of 200 metres.

The manoeuvres which the pilot must carry out with his aeroplane to get an exact aim at the enemy aeroplane to his rear are similar to those which he has to carry out when he has to aim at an enemy aeroplane in front of him. He must strike if the enemy is low down on the sighting quadrant, climb if it is high, turn to the right if the enemy is on the right, to the left if he is on the left of the sighting quadrant with regard to the aiming point.

When taking aim, the pilot does not put one eye to a hole as with the sights now in use, but looks with both eyes into the sighting quadrant placed in front of him on the dashboard at the same distance as the aeroplane controls.

In this way the pilot, while taking aim, is not entirely distracted from the control of the aeroplane, but is able to control his machine and watch his surroundings as well, like the motorist, who can always watch the road ahead even when he is looking at the rear reflecting mirror.

The instrument is not bulky or heavy.

It is at most about 30 cm. long and 5 cm. broad and high, and weighs only a few hundred grams.

The instrument requires no maintenance, and does not get dirty during use in the aeroplane.

The instrument is quickly fitted to any type of aeroplane.

.

The present system of attack of an enemy fighter will be revolutionized with this type of fighter aeroplane. The enemy aeroplane, coming up from the rear to aim and fire, comes automatically within the range of the rear reflecting sights, and, with certain arrangements of the rear weapon on the offensive fighter, when the pursuer finds the correct direction for aim, this proves to be right for the pursued as well, so that both pilots find themselves in the same conditions for firing. Neither is at an advantage, and both have the same chance of making a hit.

Hence the pilots of fighter aeroplanes must find a new method of attack.

However, the attack of a fighter from any position but the rear, besides being very difficult to manoeuvre, offers little or no chance of a hit. This chance is at most one or two per cent. of the number of shots fired.

Hence there will be less risk for the pilots of these aeroplanes, who must face the enemy every day in time of war.

The fighter aeroplane thus becomes a means of attack which is a difficult target, which can perform services of great importance to its country with a minimum of risk, and a maximum of effect.

The greatest use of this type of armament in case of war will be on fighter aeroplanes operating over the front and carrying out all kinds of missions over enemy territory.

This type of armament is not necessary for the fighters employed in home defence, as they have to pursue the enemy. In case of danger, the pilot of the fighter aeroplane is always over friendly territory, on which he can land and take off again to return to the attack of the enemy aeroplane.

The constructions of the offensive fighter aeroplane would necessarily lead to an increased use of this type of machine in air warfare.

Its lesser vulnerability will make it more effective and safer, even in the hands of pilots not yet versed in the tactics of air warfare, which mows down its victims, especially amongst pilots unused to air combat.

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BOOK REVIEWS

THE KAISER'S COOLIES. By THEODOR PLIVIER. Translated by WILLIAM F. CLARKE. (Faber & Faber. Price 7s. 6d. net.)

This book, though presented rather in the form of a novel, is obviously a transcript from life, and describes the experiences of a seaman in the Imperial German Navy during the war. It gives an excellent, though terrible, picture of the almost invariable lack of sympathy and human understanding between the average German naval officer of the old régime and his men; the brutal discipline which treated men little better than animals; the shortage of food brought about by the British blockade; the events which led up to the German naval mutiny in 1917; and the mutiny itself. For its stark realism and horror, its simplicity and sincerity, Mr. Plivier's work is outstanding, and should be read by every officer of the three fighting Services. It shows, more clearly than ever before, that discipline, though necessary in any body of men working for a common object, must be based not upon ruthless severity, but upon firmness coupled with self-abnegation and humanity. T. D.

BRASSEY'S NAVAL AND SHIPPING ANNUAL, 1932. Edited by COMMANDER CHARLES N. ROBINSON, R.N., and H. M. ROSS. 375 pages of articles and statistics, 168 pages of plans, 34 illustrations from photographs, and Index. (Wm. Clowes & Sons, Ltd. 25/- net.)

The forty-third annual issue of "Brassey," which appeared at the end of January on the eve of the International Disarmament Conference at Geneva, is a veritable mine of information, naval and otherwise. Apart from full details of the year's progress of the British and Foreign Navies, with their several building programmes, strengths and distribution, statistics of estimates, and particulars, plans and silhouettes of all classes of fighting ship, the Merchant Shipping Section deals in similar manner with the Merchant Navies of the world. But of even greater interest to readers of the ROYAL AIR FORCE QUARTERLY will be the sections of the book dealing with air matters. On pages 12 and 13 are sketched the year's developments in the British Fleet Air Arm, while pages 101 to 108 provide an excellent and authoritative summary of the Fleet Air Arms of the United States, Japan, France and Italy. Particulars of the naval aircraft used by these Powers are also embodied in separate sections on pages 335 to 338. The chapter referred to is supplementary to a full account of the British Fleet Air Arm published in last year's "Brassey."

Incidentally, it is interesting to note the importance attached to naval aviation in the United States. The five year aviation programme which was to provide the Navy with 1,000 aircraft, 1,000 officers and 1,100 men was technically completed on June 30th, 1931, at a cost of about 42,771,600 dollars, or £8,910,000 at par. In 1931 the British Navy estimates included £1,126,000 for the Fleet Air Arm, this figure representing the grant made by the Admiralty to the Air Ministry for the cost of aircraft and material supplied, and the air training of the Fleet Air Arm personnel ashore. The annual appropriation for the same, or a similar, purpose in the United States works out at about £1,782,000 a year.

The United States authorities are said to have adopted a very small

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the Headmaster's Secretary.*

flying boat for use in a submarine. It is a single-seater monoplane with a 100 h.p. engine, and can be rapidly dismantled and packed into an 8-foot tube. The loss of R101, moreover, has not deterred them from continuing to develop airships for the use of the Fleet. The new large rigid "Akron" has reached her trial stage, while the older "Los Angeles" is said to be good for service for another two to four years. This latter airship, during Fleet exercises, has on several occasions been successfully moored to the special mast fitted in the naval auxiliary ship *Patoka*. A new airship base is to be built near San Francisco, and it is the intention eventually to station one rigid airship on the Pacific coast and the other on the Atlantic.

A chapter on Commercial Marine Aircraft by the Editor of *Flight* calls attention to the "Kent" class of flying boats built by Short Brothers for Imperial Airways, the six-engined flying boat begun by the Supermarine Aviation Works in 1931, and the Saunders-Roe "Windhover" addition to the family of "Saro" flying boats produced by this Cowes firm.

To give the opinion of this reviewer, "Brassey" is one of those annual works of reference which no Service mess, library or Instructional Establishment can afford to be without. In its 375 pages of articles and statistics, its 168 pages of plans, and its comprehensive Index, it provides a mass of material which otherwise could only be delved laboriously out of a score of other publications, official and otherwise. The thirty-four illustrations, too, several of which are of naval and commercial aircraft, are on a par with the remainder of the book. The Editors and contributors are much to be congratulated on the general interest, scope, accuracy and completeness of their industrious compilation. "Brassey" has no rival. It is invaluable—and unique.

T. D.

Book Notices

LUBRICATING OIL TESTS AND THEIR SIGNIFICANCE. By J. E. SOUTHCORBE, M.Sc. (Henry Wells Oil Co., Ltd., 736-739, Salisbury House, London, E.C.2. Price 2s. 6d. net.)

This book is written by an acknowledged authority, and explains in simple language the various methods used for testing lubricating oils and, what is much more valuable, the practical significance of these tests.

There are text-books dealing with "Lubrication," written from various points of view, but we believe Mr. Southcombe's little book meets a real need. Hitherto, engineers who want to understand something about this very important and very complex subject have been obliged to buy expensive volumes, which are often out of date, and which contain a lot of matter no longer of real practical interest.

The author of "Lubricating Oil Tests and their Significance" has read papers on "Lubrication" before the British Association, the National Petroleum Association of U.S.A., and the International Lubrication Congress held at Strasbourg last year, so that his work is well known in technical circles.

In addition, Mr. Southcombe has an enviable practical experience in the application of lubricants to all types of power plant, machinery and vehicles under various working conditions.

A considerable amount of progress has been made in recent years in

our knowledge of the testing of oils, and, while the author does not suggest that oils can be judged simply on laboratory work, it is possible now to forecast with some accuracy what a lubricant is likely to do under practical working conditions. To do this, however, it is essential to take into consideration such factors as "oiliness"—the property that enables an oil to form an absorbed film on the metal surfaces—and the ability of an oil to resist oxidation.

Until recently no accurate method of measuring "oiliness" was known, but Mr. Southcombe, in a note on this important subject, describes a new "oiliness" testing machine that has proved satisfactory.

Some of the tests that have been accepted as indication of an oil's quality are shown to be no longer satisfactory and there are some useful notes on the drawing up of oil specifications. A classified short bibliography suggests books and papers likely to interest those who wish to study the subject in greater detail.

"Lubricating Oil Tests and their Significance" should be of considerable value to power engineers, works managers, buyers of oils, chemists, those responsible for the maintenance of fleets of vehicles, and even keen motorists. The published price is only 2s. 6d. net, and copies may be ordered through booksellers or direct from the publishers, Henry Wells Oil Co., Ltd., 736-739, Salisbury House, London, E.C.2.

THE MODERN DIESEL. A review of high-speed compression-ignition engines for road transport, aircraft and marine work. (Ilfie & Sons, Ltd., Dorset House, Tudor Street, London, E.C.4. Price 2s. 6d. net; by post 2s. 9d.)

High-speed compression-ignition engines running on fuel oil have made tremendous strides in the past two years, and the new development is essentially British.

"The Modern Diesel" is a comprehensive work, embracing the early history, design and application of compression-ignition engines to road transport, aircraft and marine work, and their advantages in the three important spheres named. No popular work on the subject has hitherto been attempted.

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Other chapters describe the main features of engines for road vehicles (there are over forty types available), air and water-cooled compression-ignition engines for aircraft, and many types of engine for pleasure cruisers and small marine craft. Each section is accompanied by a table, giving the leading dimensions and principal characteristics of engines in production.

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Appendix

MEMORANDUM BY THE SECRETARY OF STATE FOR AIR TO ACCOMPANY AIR ESTIMATES FOR 1932.

Air Estimates for 1932, at a net figure of £17,400,000, show a decline of £700,000 on those for the current year. Appropriations in Aid are, however, down by nearly £800,000 (mainly on Vote 8—Technical and Warlike Stores), so that the gross total is some £1,500,000 lower at £19,702,700.

The decline is the direct and inevitable result of the current financial crisis; and, whilst a number of economies of a permanent character have been effected, it has only been possible to achieve so large a reduction by the postponement of many services which, under normal conditions, would be regarded as essential, and by makeshift expedients which cannot be repeated. There has been no option but to sacrifice a number of important items in the programme, but effort has been concentrated on producing the results demanded of the Royal Air Force by the nation's necessities with the minimum loss of efficiency. In particular, no action has been or will be taken which might in any way adversely affect the safety of flying personnel. In pursuance of this general policy, a particularly large proportionate reduction has been made in the Vote for Works and Buildings, though the replacement of uneconomical and unsatisfactory war-time accommodation at certain stations is long overdue.

Further explanations will be found below beneath the several vote headings. The only special feature to which it is necessary to draw attention is the final disappearance of any reference to the "super-cut," following on a recommendation of the Public Accounts Committee. The "super-cut" on Vote 8 (Technical and Warlike Stores) had already been eliminated last year; in the case of Vote 4 (Works and Buildings) it has this year been replaced by a suitable provision for anticipated delays in the execution of major contracts, to an amount agreed with the Treasury, but not shown, as heretofore, on the face of Estimates. For the rest, there are decreases totalling £758,000 on all Votes except 1, 8 and 11, on which there are small increases amounting in all to £58,000, thus giving the net reduction of £700,000 above mentioned.

The table below gives the customary summarized comparison with the corresponding figures for 1931 :—

	1932	1931	+ or -
	£	£	£
Gross Estimate	19,702,700	21,197,200	- 1,494,500
Deduct Fleet Air Arm Grant	1,025,000	1,126,000	- 101,000
Deduct other Appropriations in Aid	1,277,700	1,971,200	- 693,500
Net Estimate	17,400,000	18,100,000	- 700,000

DISARMAMENT.

His Majesty's Government having subscribed to the Armaments Truce, no new units are being formed in 1932. In the normal course a minimum of two new Home Defence squadrons would have been added under the programme

ABSTRACT OF AIR ESTIMATES, 1932.

Votes.		ESTIMATES, 1932.				ESTIMATES, 1931.				DIFFERENCES OF NET ESTIMATES.	
		Gross Estimate.	Appropriations in Aid.	Net Estimate.	Gross Estimate.	Appropriations in Aid.	Net Estimate.	Increase.	Decrease.	No.	No.
A	I. NUMBERS.			Total Nos.			Total Nos.				
	Maximum Number of Officers, Cadets, Warrant Officers, Non-Commissioned Officers, Aircraftmen and Apprentices to be borne on the Establishment of the Royal Air Force or attached thereto, exclusive of those serving in India (other than Aden).	—	—	83,000	—	—	83,000	—	—		
	II. EFFECTIVE SERVICES.										
1	Pay, etc., of the Royal Air Force	£ 4,550,000	£ 620,000	£ 3,930,000	£ 4,573,000	£ 665,000	£ 3,907,000	£ 23,000	£ —		
2	Quartering, Stores (except Technical), Supplies and Transport	1,704,000	114,000	1,590,000	1,848,000	127,000	1,721,000	—	181,000		
3	Technical and Warlike Stores (including Experimental and Research Services)	*8,469,000	1,119,000	7,350,000	9,462,000	1,790,000	7,672,000	—	332,000		
4	Works, Buildings and Lands	1,831,500	181,500	1,650,000	2,046,000	256,000	1,790,000	—	140,000		
5	Medical Services	310,000	15,000	295,000	331,000	19,000	302,000	—	7,000		
6	Technical Training and Educational Services	438,000	10,000	428,000	495,000	11,000	484,000	—	61,000		
7	Auxiliary and Reserve Forces	516,300	200	516,000	599,200	200	599,000	—	83,000		
8	Civil Aviation	*666,000	193,000	473,000	651,000	181,000	470,000	3,000	—		
9	Meteorological and Miscellaneous Effective Services	*267,000	25,000	242,000	270,000	25,000	245,000	—	3,000		
10	Air Ministry	648,000	3,000	645,000	659,000	3,000	656,000	—	11,000		
	Total Effective Services	19,394,700	2,280,700	17,114,000	20,933,200	3,077,200	17,856,000	26,000	759,000		
11	III. NON-EFFECTIVE SERVICES.										
	Half-Pay, Pensions and other Non-Effective Services	†308,000	22,000	286,000	274,000	20,000	264,000	32,000	—		
	Total Effective and Non-Effective Services	19,702,700	2,302,700	17,400,000	21,197,200	3,097,200	18,100,000	58,000	759,000		

* Includes certain non-effective charges in respect of this service.

† Excludes certain non-effective charges in respect of the Royal Aircraft Establishment, Farnborough, which are included under Vote 8, of Civil Aviation included under Vote 8, and of Meteorological Services included under Vote 9.

Net Decrease ... £700,000

LONDONDERRY. J. M. SALMOND. H. C. T. DOWDING.
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AIR MINISTRY,
18 February, 1932.

initiated in 1928, but subsequently three times retarded, with the result that ten regular squadrons still remain to be formed for its completion. Meantime, despite general recognition of the growing dependence of the British Empire on air power as on sea power, the serious disparity between the first-line strength of the Royal Air Force and foreign air services remains as tangible evidence of the efforts made by this country ever since the war to further the cause of disarmament, alike by precept and practical example. His Majesty's Government would view the situation with anxiety, but for their earnest hope and expectation that the Disarmament Conference now in session at Geneva will bring about a reduction in air armaments.

STRENGTH AND DISTRIBUTION OF THE ROYAL AIR FORCE.

The increases in the strength of the Royal Air Force foreshadowed in last year's memorandum, viz., three new regular squadrons for Home Defence and one additional flight for the Fleet Air Arm, have been duly implemented. As a result, the present total strength of the Royal Air Force is $75\frac{1}{2}$ regular squadrons, including the equivalent of $18\frac{1}{2}$ squadrons in the Fleet Air Arm.

The Home Defence Force now comprises 42 of the 52 squadrons envisaged in the 1928 programme, and of these 18 are non-regular—8 auxiliary and 5 cadre. The decision not to proceed with the formation of any new units in 1932 entails a further retardation of this programme for the fourth time since its original initiation.

The distribution of units as between Home and Overseas remains unchanged.

OPERATIONAL AND OTHER ACTIVITIES.

(1) *Overseas*.—The only operations of importance in which the Royal Air Force was called upon to take part during the past twelve months were in Northern Iraq. As a result the 'Iraq Army, acting in co-operation with the Royal Air Force, secured the surrender of a sheikh whose turbulent activities had long been a focus of unrest in Kurdistan. Small-scale action was also taken on the North-West Frontier of India and at Aden. The normal activities of reconnaissance and communication were, however, fully maintained and the returns received from the several air commands show an actual increase in flying hours as compared with 1930. The constant vigil maintained year in year out by the squadrons on the North-West Frontier of India and in other overseas theatres such as Iraq, Trans-Jordan and Aden, calls for a large volume of flying over mountainous or desert terrain and under arduous climatic and other conditions. An interesting episode during the year was the participation of the Royal Air Force in the measures to deal with the disturbances which broke out in Cyprus in October. Seven aircraft of No. 216 (Bomber-Transport) Squadron were employed for the conveyance overseas at short notice of a body of reinforcing troops (126 officers and men in all, in addition to 80 personnel of the Royal Air Force) by air from Cairo to Nicosia; and four aircraft from No. 45 Squadron were also flown to Cyprus and carried out a series of flights on patrol or reconnaissance.

Earlier in the year aircraft of No. 86 Squadron were flown from Singapore for similar duties over rebel areas in Burma.

Some useful survey work has been carried out in Trans-Jordan where an area of the Jordan Valley, the mapping of which was urgently required for the Colonial Office, was photographed and the War Office were thus enabled to produce maps, the making of which would otherwise have entailed a lengthy and troublesome ground survey. It is proposed in 1932 to make similar use of aircraft to implement the arrangements which have lately been agreed between the British and Ethiopian Governments for the delimitation of the frontier between Abyssinia and Somaliland.

(2) *Home*.—By achieving, in September, their third successive victory since 1927, the Royal Air Force won outright for Great Britain the much-coveted Schneider Trophy. The average speed of the winning aircraft on three circuits of a course of 217 land miles was 340 m.p.h. This represents an increase of over 11 m.p.h. on the speed achieved in 1929. The very striking advance in the performance alike of machines and engines during the past decade is noteworthy; in 1921 the average speed of the winning machine was under 111 m.p.h.

Subsequently an aircraft and engine of similar design (also flown by a Royal Air Force pilot) achieved the world's speed record of 407.5 m.p.h., exceeding the previous record of 1929 by nearly 50 m.p.h. In the matter of organization and mastery of the complex and constantly changing problems of aeronautical technique, British air prestige has for long been second to none. These striking successes, due to the closest co-operation between the Royal Air Force High-Speed Flight, the technical departments of the Air Ministry and the aircraft and engine manufacturing industries, have raised it still higher, as is evidenced by the demand for British products the world over. Without the munificence of a private donor, they could not have been achieved, and a special tribute is due to her generosity and public spirit.

Air exercises were successfully carried out in July. A total of nearly 300 aircraft were engaged and approximately 2,000 hours' flying was done, both by day and night, in the two-and-a-half days during which operations lasted.

Despite much bad weather, there were no serious incidents of any description.

AIR ROUTES AND LONG-DISTANCE FLIGHTS.

The flight from Cairo to the Cape and back in the early months of 1931 was brought to a successful conclusion in scheduled time, despite the severe climatic conditions experienced on certain sections. Co-operation with the local forces was provided at Entebbe, Nairobi and Tabora. The route followed on the return journey is now being flown regularly by civil aircraft carrying mails and passengers. 18,000 miles in all were covered during the flight.

In the early part of the year a flight to Egypt was carried out by two flying boats which left Plymouth on March 24th; travelling *via* Hourtin, Berre and Malta, they reached Sollum on April 2nd. Thence they flew to Lake Timsah on the Suez Canal and subsequently returned to England *via* Crete, Athens and Naples, a total distance of 5,500 miles.

A flight of four aircraft left Egypt in October for a cruise to Nigeria and the West African Colonies. On reaching Kano, however, news was received of an outbreak of yellow fever in the Gold Coast and French West Africa, and after efforts had been made to find a practicable alternative route which would avoid the fever-stricken area, the extension of the flight west of Nigeria had to be abandoned. This decision was arrived at with great reluctance as the original programme would have marked the first occasion on which Sierra Leone (Freetown) and all the British West African colonies had been visited on a single cruise. During the enforced halt at Kano and on the return journey the opportunity was taken to carry out co-operation with troops of the Nigerian Rifles. The total distance flown on the curtailed programme was 5,000 miles.

Another long-distance flight is being carried out by four aircraft from one of the squadrons stationed in Egypt which commenced on January 11th, a tour of Kenya, Tanganyika and Uganda; the itinerary will cover some 7,000 miles.

Three flying boats flew from Singapore to Port Blair in South Andaman, *via* Rangoon, in December. A short stay was made both at the Andaman and Nicobar Islands, the object being to investigate the route as a possible alternative for flying boats travelling between Calcutta and Singapore. The return flight was

made *via* Sumatra and Penang, the length of the round journey being approximately 8,000 miles.

The mobility of Royal Air Force squadrons throughout the world and their power of mutual reinforcement are being steadily developed by such cruises as the above and by more local flights which nevertheless embrace wide areas. For example, the flying boat squadron based on Basrah has been making regular flights up and down the Persian Gulf to Muscat and beyond; the little-known Hadramaut littoral in the South of the Arabian peninsula is being gradually explored, and flights are taking place with a view to establishing an air route between Aden and Muscat, which are separated from each other by some 1,850 miles of barren and hitherto seldom-visited coastline; and, in the reverse direction, inter-command flights between Aden and Egypt by landplanes are at the present time actually in progress.

PERSONNEL AND TRAINING.

Following on the formation of the new units detailed in an earlier section of this memorandum, Vote 1 (Pay, etc., of the Royal Air Force) would have shown a substantial increase but for countervailing economies which have been effected in a number of directions. As a result of these economies, this vote shows an increase of only £28,000, despite the necessity for providing in 1932 £50,000 for an extra pay day for airmen and civilians paid weekly; and this small increase is much more than offset by decreases amounting to £151,000 in the other personnel votes (Votes 5, 6 and 7), making a net total reduction on these votes of £128,000.

Apart from the reductions in the pay of officers, airmen and civilians recently decided on by His Majesty's Government, substantial savings are anticipated from (i) the introduction of a modified scheme for short-service officers, and (ii) the reorganization of the School of Technical Training for apprentices at Halton.

As regards (i), as from April 1st next officers granted short-service commissions in the General Duties Branch will be commissioned as acting pilot officers, and will serve for a period of six years on the active list (instead of five years as at present), followed by four years in the reserve. The first year of service will be spent in training in the new sub-rank of Acting Pilot Officer (to which a slightly lower rate of pay is attached) and the revised scheme will accordingly permit of five years' employment in a fighting unit in lieu of four. The Royal Air Force will, therefore, gain in efficiency by the increased experience of its short-service officers. Moreover, the additional year's service by each officer will render possible a reduction in the annual intake with a consequent saving in the cost of training; it will also result in individual short-service entrants having improved prospects of selection for permanent commissions. Since candidates over 21 years of age will not in future be considered, there should be no increase in the average age (which has, of recent years, been steadily reduced) of short service officers returning to civil life.

As regards (ii), the School of Technical Training at Halton is being reorganized on a basis of two wings (instead of three as at present) in the light of the reduced intake of aircraft apprentices, and substantial economy in instructional staff is thus rendered possible. There will, however, be no lowering of the standard of training given, which it is essential to maintain at its present high level in order to ensure the efficient and safe maintenance of aircraft. As a result of these and other savings, Vote 6 (Technical Training and Educational Services) shows at £428,000 a reduction of £61,000 as compared with the current year.

The experiment is being tried of employing a slightly increased proportion of airman pilots as flying instructors in lieu of officer instructors; the scheme will also allow of the selection of instructors from among officers and airman pilots who have somewhat longer flying experience than has been possible in the past, and will thus

tend to raise still further the already high standard of flying instruction. Airman pilots so selected as instructors will have their normal period of five years' flying service extended to eight years. The combined effect of these changes will be an appreciable saving in officer personnel and consequently in cost, and an improvement also in the career open to airmen.

Further progress has been made with the policy of relieving officers of such technical duties as can properly be performed by airmen, by means of the appointment of warrant officers and senior non-commissioned officers in the place of flying officers as signals and photographic instructors in squadrons.

RESERVE AND AUXILIARY FORCES.

The net total of Vote 7 is £516,000, a reduction of £88,000 on the current year's figure. The reserve pay of airmen, which was fixed at 1s. a day in 1921, since when, the cost of living index figure has fallen by 40 per cent., has been reduced by 25 per cent. to 9d. a day. The strength of the airmen's reserve has also been temporarily curtailed. These two measures are estimated to produce savings of over £50,000. The balance of £88,000 will accrue mainly from reductions in the amount of voluntary additional flying by Reserve pilots, in the payments to civil companies for flying training, and in the retaining fees payable to officers of the Reserve. These measures of economy are already in operation.

Apart from the minor restriction mentioned above, it has been found possible to secure the necessary economies in expenditure on the reserve and auxiliary forces without too serious curtailment of the normal training programme.

A notable feature of the training of the Cadre (Special Reserve) squadrons during 1981 was the participation, for the first time, and with highly satisfactory results, of two units, viz., No. 502 (Ulster) Squadron and No. 508 (County of Lincoln) Squadron, in night flying operations during the air exercises. Day-bombing squadrons of the Auxiliary Air Force also played an important rôle in these exercises, and showed once again a very high standard of flying and general efficiency. Bomb-dropping practice was seriously handicapped by bad weather during the summer.

During 1981 the number of flying hours completed by the University Air Squadrons at Oxford and Cambridge showed a further increase, chiefly in cross-country flying. Formation flying for the more experienced members was introduced for the first time. The number of proficiency certificates gained during the year reached a total of 74. For this certificate a member must, in addition to carrying out a certain number of hours' solo flying, pass an examination in four basic aeronautical subjects. Both squadrons were maintained at full strength throughout the year, and each has a long waiting-list of candidates for membership.

TECHNICAL EQUIPMENT.

Vote 8 (Technical and Warlike Stores) shows a net total of £7,850,000, being a decrease of £322,000 on the figure for 1981. There is further a heavy decline in Appropriations in Aid primarily due to reduced provisioning for units in India and the Fleet Air Arm.

This vote, representing as it does over 40 per cent. of total air expenditure, has inevitably had to make the largest single contribution to the reductions in expenditure necessitated by the financial crisis. The decline in the net figure above-mentioned is, however, only 4 per cent., or proportionately much smaller than on other votes, any larger reduction being precluded by considerations of the vital importance of maintaining the technical equipment of the Royal Air Force at the highest possible pitch of efficiency. The re-armament of squadrons has neces-

sarily been curtailed, but fortunately all machines of war-time design were already due to pass finally out of service on completion of the current year's programme, and the Force is already to a large extent equipped with aircraft of types brought into service within the past five years.

Indeed, as a result of the steady progress in re-armament of recent years, it may be said that the era of wooden aircraft has, in so far as the Royal Air Force is concerned, passed into history, and in 1932 its first-line units will be wholly equipped with machines either of all-metal structure or composite of metal and wood. Wood is, indeed, now employed only for the wings and tail units of a very small number of the older types and for certain small components. Experience is showing that aircraft of metal construction undoubtedly have a longer life than those of wood, and, in consequence, considerable economies in maintenance costs are being effected.

The replacement of worn-out mechanical transport is still proceeding, though in the present stringency it has been necessary materially to reduce expenditure under this head in 1932. A considerable measure of replacement has, however, already been effected, and the substitution of newer and more efficient types of vehicle has enabled material reductions to be effected in the total establishment of motor transport which would otherwise have been required. The number of vehicles on charge to-day is in fact substantially lower than six years ago, despite the increase in the size of the Force since that date. The fitting of pneumatic tyres to heavy vehicles is another measure which has been found to be productive of economy by increasing their life.

There is again a rise in the amount taken for petrol to meet the higher prices and the larger consumption due to increased flying and the use of more powerful engines.

RESEARCH AND TECHNICAL DEVELOPMENT.

The total allotted to Research and Technical Development is shown as usual in Appendix I of the Estimates. At £1,458,000 there is a decline of £116,000 on the current year's figure. As has already been announced, it has been decided, owing to the imperative need for reducing expenditure, not to proceed with the construction of a large civil flying boat, thereby releasing funds for other and more urgent requirements, in particular a fast mail-carrying aircraft. The research and technical programmes have had to be curtailed in a variety of other directions in order to effect the necessary economies, a process which has, however, been assisted by the completion of certain works at Farnborough.

The compressed air tunnel at the National Physical Laboratory will shortly begin its research programme, and in 1932 the modernization of one of the existing smaller tunnels at the Laboratory will be put in hand. Construction of the large wind tunnel at the Royal Aircraft Establishment, Farnborough, is also about to begin. A model for this tunnel was constructed in the form of a small 5-ft. tunnel, and this has proved so efficient that a new power plant is being provided which will enable the tunnel to be run at an air speed of 200 m.p.h.—the highest speed of any wind tunnel in the country.

The vertical tunnel, in which the wind is forced upwards instead of horizontally, enables an aircraft model to be set spinning in the rising column of air and its characteristics to be observed. This tunnel is 12 ft. in diameter and provides a most valuable medium for investigating the all-important problems associated with "spinning."

The seaplane testing tank at Farnborough has been erected, and, as soon as the adjustment of its carriage and mechanism (which require the greatest possible accuracy) is complete, a full programme of research will be set in train.

The reorganization and reconstruction of the Royal Aircraft Establishment are now almost complete.

Among interesting developments of the year it may be mentioned that, for the purposes of the Schneider Trophy contest, a water-cooled engine, already of high efficiency and rated at 825 h.p., was developed to give no less than three times that power. Elsewhere the application of superchargers to maintain the horsepower obtained at ground level up to altitudes of 11,000 or 12,000 feet has been extended and has entailed a special study of the freezing of carburettors at exceptionally low temperatures. An important series of flying trials at heights up to 15,000 feet has recently been completed with the special object of ascertaining the best means of obtaining fuel economy. Attention is being devoted to further experiments with compression-ignition engines intended primarily for large aircraft flying over long distances, in which the maximum economy of fuel is essential.

AIRSHIPS.

His Majesty's Government having reluctantly reached the conclusion that the financial crisis necessitated cancellation of the proposed programme for the re-fitting and operation of the R100 and the final disposal of that vessel. Cardington and the overseas bases at Ismailia and Karachi have been reduced to care and maintenance parties. A small nucleus staff is being retained at the Royal Airship Works to keep abreast of technical developments in other countries and to continue with a modest programme of research and experiment.

The provision of £16,000 in these Estimates covers the cost of the maintenance parties at Cardington, Ismailia and Karachi, and of the small technical section above mentioned. Buildings, machinery and plant are being kept in such a condition that they can readily be made available for use if required, either for our own purposes or for the reception of visiting airships from abroad.

WORKS.

The net total of Vote 4 at £1,650,000 is £140,000 below that for 1931, a reduction of approximately 8 per cent.

In view of the financial stringency, the new services proposed are confined to urgently required improvements in the accommodation of certain existing units, many of which are still housed in temporary buildings quite unsuitable for permanent occupation. Provision is made for the replacement of such buildings at a number of Home stations, and for the construction of suitable accommodation for units of the Fleet Air Arm at Hong-Kong, which have, since 1927, occupied very unsatisfactory quarters improvised during the emergency of that year.

Expenditure on works services in 'Iraq, Palestine and Trans-Jordan, which is repayable from the vote for Colonial and Middle Eastern Services, has been reduced by £58,250.

CIVIL AVIATION.

The gross total of Vote 8 (Civil Aviation) is £666,000, which includes a sum of £166,000 repayable by the Government of the Union of South Africa and other African administrations in respect of the air service from Cairo to the Cape. The net total of this vote is £478,000, an increase of £3,000 on last year's figure. Contractual subsidy payments to Imperial Airways in respect of their European, Indian and African air services will amount in 1932 to £541,000, from which the above-mentioned figure of £166,000 must be deducted, leaving a net sum to be voted under this head of £375,000.

The first machine on the through service between Cairo and Cape Town left Cairo on January 24th, and the whole service is now in regular operation in exten-

sion of the previous preliminary service to Mwanza (Tanganyika). In the case of the route to India, the permission accorded by the Persian Government to Imperial Airways to fly along the Persian Coast expires on March 81st. Its renewal is still under discussion with the Persian Government, and in the meantime preparations are in train for the use of an alternative route, if required. Provision has been taken for the ground organization and other additional expenditure which will be necessary, if this alternative route is brought into operation.

The major project, referred to in last year's memorandum, for the extension of the Indian service to Australia has again had to be postponed owing to the economic difficulties in this country and in Australia.

As a result of arrangements with the Manchester Corporation, who will erect the buildings and pay a small charge, provision has been made to equip a wireless and Meteorological Station at Manchester to serve the needs of civil aviation in the North of England.

A small amount has been included for further urgent work on the surface of the London (Croydon) Air Port and for improving the lighting arrangements at that aerodrome and along the air route to the Continent.

METEOROLOGY.

Despite the developments dealt with below, the estimated expenditure on Meteorology (Vote 9) during 1932, shows a net reduction of £1,000. The gross figure at £158,000 is £2,000 lower.

The civilianization of the meteorological service in 'Iraq, the cost of which is in consequence transferred to this vote from Vote 1, will be completed in 1932, and a full year's provision is included (£5,000). The consequent increase in the salary sub-heads is, however, partially set off by a saving of £4,000, to be obtained by discontinuing the separate organization for airship meteorology.

Expenditure on instruments and equipment will be reduced to £9,000, showing a reduction of £2,000, but receipts from the sale of instruments are also expected to be lower, so that the net saving under this sub-head will be £1,000.

Normal research items will be restricted to £1,000, but a special provision of £4,000 is included for research in meteorology and magnetism in Polar regions. This expenditure will take the form of a grant-in-aid to the Royal Society and the Royal Society of Edinburgh, and is part of the international programme for the Second Polar Year, the object of which is to repeat and extend the meteorological and magnetic survey which was carried out by international co-operation in 1882-1883. A party of British meteorologists is to be sent to Fort Rae, in Canada, where a British station was maintained during the First Polar Year, fifty years ago.

Building and renovation at meteorological stations are being restricted as far as possible, and expenditure on works services is reduced by £2,000.

A variety of minor economies are being effected under other heads.

AIR MINISTRY.

Vote 10 (Air Ministry) is again reduced, and is lower than last year by £11,000.

The saving is in the main due to the effect of the reductions in civilian salaries and in the pay of officers of the Royal Air Force decided upon last autumn, which more than offset automatic increases under incremental scales. In addition, as a result of a continuous review of staff in all departments, certain minor economies have been effected, despite the steady growth in the strength and activities of the Royal Air Force and the continuous development of civil aviation.

LONDONDERRY.

AIR MINISTRY,
February 25th, 1932.

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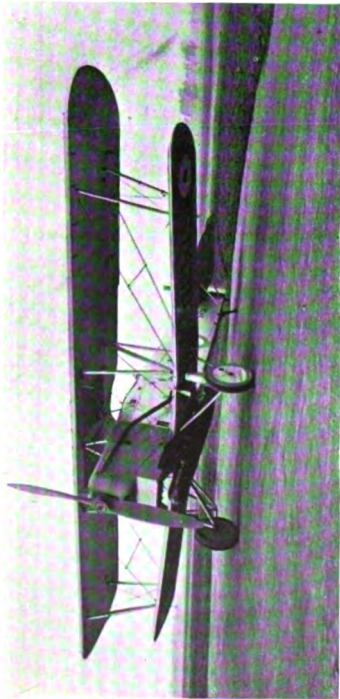
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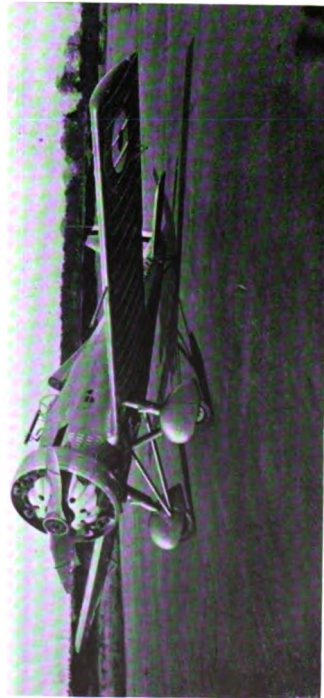
R.A.F. DISPLAY—EXPERIMENTAL TYPES.



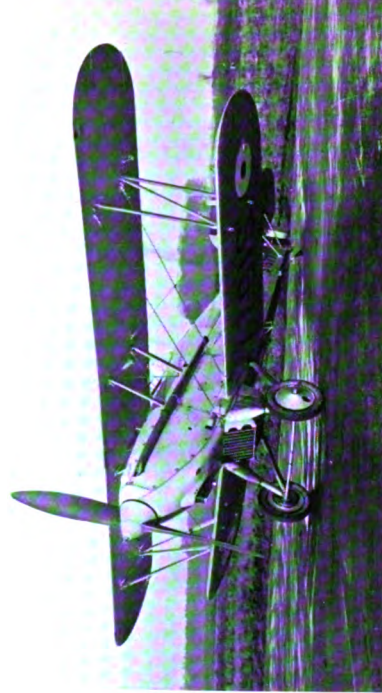
THE HAWKER HORSLEY.



THE HAWKER HART.



1. VICKERS INTERCEPTOR FIGHTER.



4. THE HAWKER NIMROD.

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R.A.F. DISPLAY—EXPERIMENTAL TYPES.



2. THE HAWKER OSPREY



THE HAWKER AUDAX.



10. THE VICKERS VILDEBEESTE.

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R.A.F. DISPLAY—EXPERIMENTAL TYPES.



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3. THE BRISTOL BULLDOG III A.



9. THE BRISTOL 120.

R.A.F. DISPLAY—EXPERIMENTAL TYPES.



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5. THE WESTLAND P.V.6.



8. THE SHORT VALETTA.

R.A.F. DISPLAY—EXPERIMENTAL TYPES.



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6. THE GLOSTER TROOP CARRIER.



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THE VICKERS VICTORIA TROOP CARRIER.

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14. THE BLACKBURN CIVIL BIPLANE.



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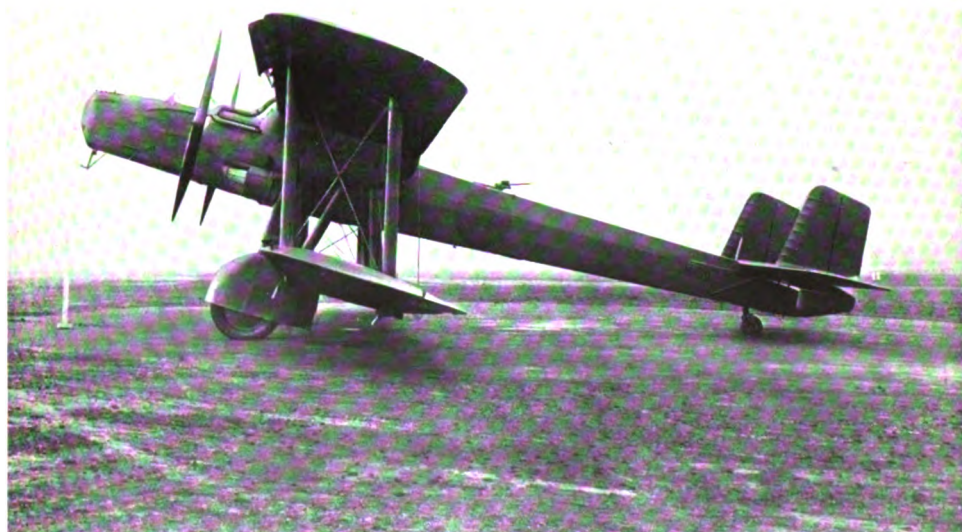
7. THE ARMSTRONG WHITWORTH ATLAS.

R.A.F. DISPLAY—EXPERIMENTAL TYPES.



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11. THE BOULTON & PAUL SIDESTRAND.



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12. THE HANDLEY PAGE NIGHT BOMBER.

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13. THE FAIREY NIGHT BOMBER.

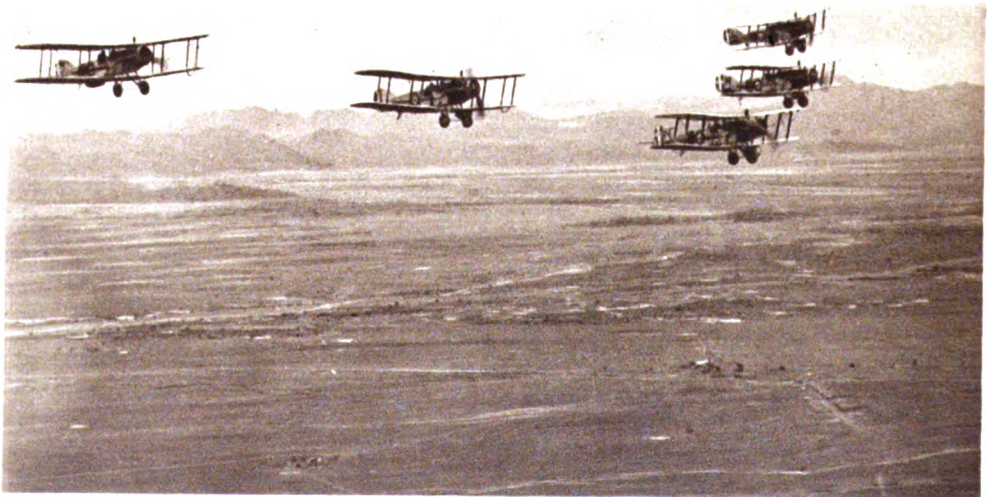


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ESSAY, 1931-32

SQUADRON-LEADER R. P. M. WHITHAM, M.C., p.s.a.

SUBJECT.—*Discuss how the Royal Air Force can best assist a landing on a large scale in the face of a powerful air force, when the landing is taking place beyond operating air range of our own or of friendly territory.*

MILITARY LANDINGS.

A LANDING upon the enemy's coast has been for centuries a normal expression of the British method of making war, and operations of this kind have many times been undertaken as a method of disturbing the enemy's plans and strengthening our own position.

The geographical distribution of the British Empire is singularly adapted for the employment of armed forces in this rôle, and an even more important factor is that, for so many years, Great Britain has been almost paramount at sea and consequently the defence of expeditions against enemy naval attack has been guaranteed.

Military landings of various degrees of importance have been carried out. They have ranged in date from Drake's attack on San Domingo in 1585 to the Dardanelles Expedition of 1915. Among them were the failures of Rochefort in 1757 and Walcheren in 1808, and also the successes at Quebec in 1759 and at Alexandria in 1800. Although these expeditions were by no means uniformly successful, the justification for them was rarely in doubt. Whether the military effort was attained locally with complete success or not, the very fact of its being made, and there being a chance of its succeeding, was of definite strategical value in that it led to important diversions of the enemy's forces. It would have been a different matter if an expedition had been in jeopardy prior to its landing, but this contingency, owing to British sea power, has always been a very remote one and has not been regarded as critical when the expedition was being planned.

Looking to the future, it is clear that situations may again arise when it may appear desirable to effect a military landing upon an enemy's coast. In the future, however, an important new factor enters into the situation. Just as control of the seas has previously been of the utmost importance, control of the air must enter largely into the conduct of the operation.

Before considering this new factor in detail, it may be advisable to set out the other factors affecting a combined expedition. The influence of air power must necessarily be to some extent a matter of speculation and we may derive guidance from consideration of factors the influence of which can be traced from actual experience.

GENERAL FACTORS.

Apart from all questions of direct enemy interference, a large-scale landing, to have prospects of success, calls for a combination of important conditions. An adequate military force must be available, and this must include all the arms, equipment and ancillary services necessary for it to carry out its task when it has landed in the enemy country. Sufficient shipping and landing craft must be available to convey the military force to its destination, and allow of its being put ashore in the appropriate manner. Suitable ports for embarking the force must be found and advanced bases may be necessary. The enemy coast must be topographically suitable for the landing and weather conditions must also be favourable.

Plans for a landing must be prepared in very great detail, and it is necessary for them to be worked out by tracing backwards from the prospective culminating stages of the landing in order to arrive at the correct original dispositions and requirements. The issue or amendment of orders, once the troops have embarked, is a matter of extreme difficulty owing to the fact that the force, and even individual units, are split up against the various ships. A complex arrangement of communications is necessary, both on the ships during the approach and in the course of the landing, and also between the ships and the shore in the early stages of the operations on land. In fact, the plans and material preparations need most careful adjustment and their adequacy is very susceptible to derangement from untoward events. A landing on an enemy coast is, under the best of conditions, a complicated operation and even a small degree of enemy interference may have far-reaching effects.

NAVAL FACTORS.

The naval factors affecting a combined landing are of particular interest because it is possible to draw an analogy between them and the air factors owing to their general similarity.

There are several naval considerations which need not be dealt with in detail: for example, ports of assembly for the expedition are required; naval covering fire in support of the landing must be arranged; and the sea area near the landing-place must be swept clear of mines. These considerations, however, take secondary places when compared with the one outstanding naval requirement, which is that

the expedition must be protected from enemy sea-borne attack during its approach and during the landing. When an enemy naval force is in the position even to threaten the safety of the expedition, serious naval problems immediately arise. It is always a difficult matter for a naval force to convoy a number of defenceless ships and simultaneously fight a sea battle. The problem of combining these two incongruous tasks need not be explored, as they are strictly a matter of naval warfare, but it is quite obvious that even a very short bombardment of the transports by enemy naval craft would have disastrous results. Further, one must nowadays take into account the increased offensive value of naval flotilla craft such as submarines and coastal motor-boats. The well-known effect which was produced at Gallipoli by a few enemy submarines furnishes an excellent example of the potentialities of this new method of naval interference with landing operations, although it actually and fortunately only took place when the British force was securely established ashore.

Under modern conditions, even allowing for evasion, it may be accepted that, unless the enemy's naval vessels can be definitely contained, the safety of the expedition will be precarious. If the enemy has a working command of the sea, then the hazard of the enterprise is clearly extremely serious.

At this point the analogy between the naval and the air factors can be drawn, for, if attack by surface craft is of so great importance, then air attack must be equally important, for it is reasonable to assume that a force of enemy aircraft can do just as much damage to a collection of transports as can enemy naval vessels.

MILITARY FACTORS.

The military factors affecting a landing exert their most important influence from the stage when the expedition is in close proximity to the enemy coast. In recent times, they too have become of increasing complexity and importance.

In the past, land artillery was not very accurate and had a very limited range. The available fire-power of the defending troops was not very great, and material contrivances, such as beach and underwater obstructions, were little used. In the Russo-Japanese War, signs were evident of new developments in coast defence, but it was not until the Dardanelles expedition that the value to the defender of modern artillery, machine guns, and barbed wire was fully realized. We now know that the resources possessed by the Turks for the defence of the landing-places in Gallipoli were very meagre, but it was found that they had the ability to inflict severe losses on the troops when landing and seriously to upset the British plan of operations.

The possession by a modern enemy of these effective means of defence necessitates the expedition being equipped to meet them. Instead of a lightly armed fighting force, such as was adequate in the past, it now seems essential to employ a force equipped with all modern weapons, including even armoured fighting vehicles. The presence of this additional and heavy material greatly complicates the actual landing, and the arrangements for the replenishment and maintenance of a mixed fighting force ashore influences unfavourably the subsequent operations whilst that force is working from a base hastily organized on beaches.

The factors are brought out here, because, when later we turn to the air aspect, the difficulties under which the landing force is put ashore and must subsequently work, will be of some relevance.

SURPRISE.

Before turning to the particular situation given in the subject of this essay, it may be worth while to consider the importance, in combined operations, of the use of surprise. This has a bearing on both the naval and military aspects, and is intimately connected with the influence of aircraft.

If the enemy can be taken unawares, it is clear that a landing will be greatly facilitated. The risk of enemy interference both by land and sea will be lessened, and his precautions for the defence of the landing-places will be small. It is very desirable that this should be so, in view of the increased powers of naval offence and military defence which in recent times have become available to the enemy.

Unfortunately, however, modern developments have also affected the ease with which surprise can be secured. Shipping intelligence; industrial activity; the use of wireless communications; the activities of agents; all these, in modern times, afford means whereby the enemy or potential enemy can ascertain whether an attempt is being made to assemble a large landing force without his knowledge. The ultimate destination of the force can probably, if due precautions are taken, still be concealed by the attacker, but the enemy will no doubt be able to deduce fairly accurately if, and in what general locality, he is to expect attack.

It only remains for him to ascertain definitely the intended landing-places, and to distinguish between feints and real landings, and his task of defence is very greatly facilitated. The greatest handicap under which the defender of a coast is called upon to operate is the uncertainty as to where the offensive force will land. Until he knows this he is unable to make his proper dispositions; once he knows it, he can concentrate the whole of his available force to meet the attack.

THE SITUATION GIVEN FOR DISCUSSION.

We are now in a position to summarize the general factors affecting a landing on a large scale. Very briefly, they are as follows :—

- (i) Extensive preparations are necessary.
- (ii) Detailed plans are required, and these cannot easily be altered at later stages.
- (iii) Control of sea communications is essential.
- (iv) The military force must be equipped with complex and heavy fighting material.
- (v) Surprise is of the greatest importance.

These factors have so far been considered irrespective of the influence of aircraft. It is now necessary that we should turn to the air conditions of the particular situation which is to be discussed in this paper, for it is with relation to these that the air factors in general can conveniently be brought out.

We are told that the landing on a large scale is taking place "in the face of a powerful air force," and that it is "beyond operating air range of our own or of friendly territory."

A suitable method of considering the air factors seems to be, firstly, to deal with the potentialities of aircraft in the hands of the enemy, and, secondly, to survey the air facilities available for the expedition. These latter may be divided into air support of the landing and into counter-measures against the enemy's air activity.

It is not possible for us to draw upon definite experience of the past, for, although aircraft were available during the Gallipoli expedition, their development was in so rudimentary a stage that no definite lessons were afforded.

The air factors, unlike the naval and military ones, are still a matter of theory; nevertheless, the arguments whereby they can be arrived at are not pure hypothesis. Modern experience of the capabilities of aircraft indicates reasonably clearly what can be expected of them in connection with a large-scale landing.

EMPLOYMENT OF AIRCRAFT BY THE ENEMY FOR RECONNAISSANCE DUTIES.

The operations conducted by the defender of a coast can be divided into two phases. The aim in the first phase is to avoid being surprised by the landing force. Having detected the approaching expedition, the aim of the second is to prevent any attempt at a landing from being successful. In both of these, aircraft can play a most important rôle.

The enemy, if in possession of a powerful air force, can and will use his aircraft for reconnaissance. He will already have availed himself of other intelligence resources to ensure that the landing force

has hope of little more than local surprise. To deprive them of this, on receipt of information indicating the possibility of a landing being attempted, he will send out his reconnaissance aeroplanes over the sea approaches to the greatest possible distance and with great determination. The value of the information is so great that he can afford to run risks in order to obtain adequate warning.

Now a convoy of ships sufficient to carry a large landing force will necessarily be conspicuous whilst at sea in daylight. The reconnaissance aircraft will therefore have little difficulty in covering large areas of water in their search. Further, they will be able to see the convoy from a considerable distance and thereby avoid being intercepted by the convoy's protective aircraft. As an endeavour to avoid observation, the convoy may possibly make its final approach to the coast during the hours of darkness, but in doing so it is handicapped because of the limited distance which can be covered in the time available. The ships suitable for the conveyance of a large force are probably limited in speed to twelve or fifteen knots. This means that during the hours of darkness they can cover only about 150 miles, and this distance is inadequate to escape air reconnaissance if it is well conducted. Aircraft with a range of 200 to 300 miles will probably see the convoy before it can make use of the cover of darkness, and once the defender is in touch with the convoy he is unlikely completely to lose it again. Even if he cannot follow all its movements in detail, the approaches to all potential landing-places can be continuously searched by means of flares.

It is almost a certainty that the actual landing operations would have to be deferred until daylight, as a task of this nature, carried out in darkness, is fraught with difficulties so great as to be almost prohibitive. If there is a transfer of troops from transports to small craft, there is sure to be great delay and confusion, and even when the force has been satisfactorily transferred to the landing craft, the maintenance of direction of approach to the shore and the actual disembarkation will be most difficult. It is therefore very likely that the landing will have to be carried out in daylight, when the defender will once more be able to use his aircraft to full advantage.

It is unlikely that, as is possible in other forms of sea and land operations, the attacking force could take advantage of weather conditions unsuitable for the employment of aircraft, because if the weather were unfit for flying, owing either to fog or storm, it would be equally or even more unfit for the landing to take place.

It is therefore apparent that, unless some effective counter-measures are available, a large-scale landing on the coast of an enemy with a powerful air force will be compelled to operate deprived of the invaluable advantage of surprise.

OFFENSIVE EMPLOYMENT OF AIRCRAFT BY THE ENEMY.

If to the defender the reconnaissance value of his aircraft is great, their offensive value is even greater. In the first place, they are a weapon which offers singular facilities for rapid concentration. Coast defence artillery, beach obstructions, and defensive works all suffer in value from their immobility. If they are adequately to cover an extensive coast, they will entail great expense in provision and maintenance, and even then there is no guarantee that the landing force may not choose some place which has been overlooked, or considered unnecessary to defend.

Military forces suffer, to a considerable extent, from the same handicap. It is obviously inadvisable that they should be strung around the coast as a cordon; "fit," as Napoleon said, "only to deal with smugglers." Lateral communications on any coast are usually bad, and therefore if the troops are kept in some central place it may not be possible to bring them to the actual landing area in time to be fully effective.

In his aircraft, the defender has an arm without any of these disadvantages. His plans will therefore involve the use of them to the fullest possible extent. They can be held in readiness, dispersed in security from air attack, on aerodromes at considerable distances inland. And yet, on receipt of warning, they can be brought into action in a very short time in effective concentration at the decisive place. They can be used for attacks on the landing force continuously from the time when it is detected at sea. The attacks can be continued during the stage when the landing craft are being filled and launched, and whilst the landing is in progress. They can be supplemented by low-flying attacks upon the troops whilst in boats and whilst disorganized during the first few hours on shore.

Even should the landing force secure a footing, and clear a zone of coast from defensive land fire, the supplies and reinforcements have all to be brought to the beaches in small craft, landed on temporary piers, man-handled ashore and then dumped in very restricted areas. These activities present most favourable targets for air bombardment, not to mention the transports and store ships themselves, which, lying in close proximity to the beaches, will be equally exposed to air action. Anyone who remembers, or who has seen photographs of, the great concentrations of shipping at Mudros and the congestion on the Gallipoli beaches will realize what air targets there were presented.

It is quite clear that, unless we can discover effective counter-measures available for the landing force, the defender of a coast has, in a powerful air force, a weapon calculated to interfere so seriously with the landing operations that their success becomes most problematical.

AIR RESOURCES OF THE LANDING FORCE.

We have been told that the landing is taking place beyond operating range of our own or of friendly territory; for aircraft, therefore, the landing force must depend upon what can be carried with it in ships, or possibly, upon the use of large seaworthy flying boats, which could be refuelled during the sea journey.

The aircraft carried by the expedition, if to be used in the early stages before an extensive footing is acquired ashore, are mainly confined to those working from capital ships and aircraft-carriers. Aircraft carried by capital ships are necessarily limited in number, in individual size and in armament. Even the latest type of ship can carry only two aeroplanes, and once these aeroplanes have been launched their subsequent recovery is greatly dependent upon sea conditions and may involve loss of time. Against determined enemy air attack, their collective value as an air force is very questionable.

The bulk of the aircraft of the landing force will therefore be those conveyed by the aircraft-carriers. Carriers have a certain advantage in that they are mobile, and can, if necessary, go on ahead of the convoy to employ their aircraft. By doing so, however, they may give away the presence of the expedition and thereby lose any remaining possibility of obtaining surprise.

On the other hand, the carriers themselves are very vulnerable to both sea and air attack, and slight damage to a carrier may immobilize all the aircraft on board and also entail subsequent loss of many of the aircraft from the carrier which happen to be in the air at the time. Also an aircraft-carrier is of little value for operating aeroplanes in darkness.

When opposed by land-based aircraft, carrier-borne aircraft are severely handicapped by the limitations in size and performance, by the limited speed with which they can be operated from the carrier's decks, by the difficulty in co-ordinating their activities, and by the necessity for an extremely carefully arranged programme of flying-off and landing-on, which is at all times dependent upon favourable sea conditions.

Sea-going aircraft accompanying the expedition may be of considerable value for air bombardment and reconnaissance duties, but their heavy construction and necessarily poor performance renders them far from suitable for offensive air combat.

Individually, therefore, the aircraft of the expedition are at a tactical disadvantage against the land-based air forces of the defender of the coast. The strategical aspect of their employment is also unpromising.

The operational control of ship and carrier-borne aircraft is a matter of complexity, owing to its being dependent simultaneously upon both

air and naval factors. Whilst the air force commander of the expedition is alone able to appreciate the air situation and to co-ordinate the air activity, the actual flying-off and landing-on of the aircraft, being affected by sea conditions and naval factors, must remain under naval control. The air force commander will probably be aboard the headquarters ship; the carriers may, and in fact are most likely to, become separated from the convoy and from one another. Owing to difficulties of communication and liaison, the rapid execution of orders, which is so essential in the handling of air forces, may become almost impossible.

Further, the aircraft of the expedition, of necessity, work from a few congested and conspicuous places, whilst the defender will probably have the choice of numerous aerodromes, allowing of dispersion of his force when not in action. The enemy will thus have ideal air targets of vital importance, that is, the carriers and the convoy, by the attack of which he can fix his opponent's air forces at will and engage them in battle. On the other hand, what course is open to the air forces of the expedition if the defender chooses to refrain from air battle until some given moment favourable to himself? Knowing the difficulty for the expedition in putting up a big concentration of aircraft, he may decide to deliver his air attack by the whole of his force at one blow, perhaps just as the convoy was anchoring.

The targets for air attack by the expedition may be widely dispersed and difficult to find. They would need to be reconnoitred, and thereby the presence of the expedition and its ultimate aim might be given away. If targets were found, time would be necessary to disseminate the information obtained amongst all the ships concerned. The convoy could not cruise about indefinitely whilst awaiting the outcome of the air operations, nor could it proceed with the landing and face the possibility of meeting at that moment the whole of the undefeated enemy's air force.

Without having gone too deeply into the matter, it is clear that the air forces of an expedition suffer from very great handicaps if they are to oppose a powerful air force securely based ashore.

ANTI-AIRCRAFT FACILITIES OF THE LANDING FORCE.

This survey of the air resources of the expedition is so far not of a very encouraging nature, but for air defence the landing force does not, of course, rely solely upon its aircraft. It will have available its anti-aircraft armament, and might make use of some passive form of air defence such as concealment by smoke.

The main anti-aircraft defence must fall upon the naval vessels, for it is unlikely that the transports in the expedition could be equipped

with anti-aircraft guns and the fire-control apparatus necessary for their effective employment. The transports would probably have a limited amount of small arms defence only.

In estimating the efficiency of anti-aircraft fire from warships, there are some interesting points. Naval anti-aircraft guns are operated under a disadvantage as compared with similar guns on land. Firstly, the motion of the firing ship adds considerable complications to maintaining speed of fire. Secondly, the masts and rigging and superstructure of the ship curtail the effective zone which the individual guns cover. Thirdly, although the anti-aircraft fire of one ship may be effectively controlled, co-ordination of the fire of several ships is extremely difficult.

The enemy may attack the convoy from several directions simultaneously, and this would present to the expedition's anti-aircraft armament a task which it is doubtful could be dealt with adequately.

The anti-aircraft defence during the actual landing is in no better position. The landing craft, crowded with men, may have one or two machine guns each for use against aircraft, but these would be inadequate against well-directed low-flying attack, and no use at all against high bombing. The guns of the ships might possibly cover the area of landing, but on a shallow coast they might be out of range, or, what is more than likely, they would be fully occupied in defending the ships in the anchorage.

Once ashore, the military force would need to establish itself very securely before anti-aircraft guns could be landed. The modern anti-aircraft gun is a heavy weapon requiring a level platform and complex fire-control instruments, and could not be put ashore until the situation on the beaches was well established. Further, in all air-defence plans, it is of the utmost importance to have early warning of impending enemy air attack. The expedition is, to a great extent, deprived of this warning. During the approach of the convoy, outlying naval craft might afford some assistance, but once near the landing-place there would be no means of obtaining information except by the use of aircraft. These would probably not be very effective, and would entail a dispersion of force which could be ill-spared.

There is the possibility that the landing craft might, by the use of smoke, conceal themselves from the enemy, but this is not a promising one. An almost inconceivable amount of smoke would be necessary to cover the whole of the ships of the expedition, and even then, although smoke screens may be effective when viewed horizontally, when viewed vertically, as from an aeroplane, they are usually easily penetrable.

It seems that the anti-aircraft measures available to the expedition afford little promise in their effectiveness. They certainly afford no

compensation for the obvious handicaps under which the aircraft of the force participate in the air defence arrangements.

SURVEY OF THE POSITION AS A WHOLE.

In his endeavour to investigate how the Royal Air Force can best assist a landing on a large scale in the face of a powerful air force, the writer has felt compelled to trace at some length the factors affecting military landings in general and this special situation in particular. It has emerged in the course of the review that the situation of the landing force is far from a favourable one. At every stage in the operations, from arriving within aircraft range of the enemy, the expedition is seriously handicapped in dealing with enemy air action.

Our original problem was to find how the air force could best assist in these circumstances. The writer believes that they can best assist by facing the facts which have been brought out by this appreciation. The truth is that, for a military landing under modern conditions, control of the air is just as essential as is control of the sea; and against a powerful modern air force, control of the air can only be established by an air force able to meet and defeat its adversary in approximately equally favourable conditions.

However great the number of capital ships, however many the carriers, the inherent limitations of their aircraft and the circumstances in which they are compelled to operate, preclude their being able to secure air superiority over a powerful land-based air force. And, nothing less than complete air superiority will suffice. A military landing on an enemy coast is a task of such obvious delicacy that serious enemy air interference could not be tolerated at any stage in the operations.

Sir Julian Corbett has written: "Against an enemy controlling the line of passage in force, the well-tried methods of covering and protecting an overseas expedition will no more work to-day than they did in the past. Until his hold is broken by purely naval action, combined work remains beyond all legitimate risk of war."* Substitute the word "air" for "naval" in the last sentence, and this quotation applies in its entirety to a situation where an enemy has a powerful and undefeated air force.

It is essential, if the enemy is so equipped, that before a military expedition can land on a coast within enemy air range, the air forces of the expedition must be established ashore, and given time to defeat their enemy. Air superiority is not a situation to be created in a moment or at will. It may only be obtained by intensive operations over a considerable period, and until it is obtained the landing force should no more be dispatched than it should be if the enemy fleet were still in control of the sea.

* "Some Principles of Maritime Strategy," page 278.

CONCLUSION.

During a recent Staff exercise, the senior military officer present, in the course of his final remarks, stated that no recent development had more fundamentally affected warlike operations than the advent of air power. This is a statement with which everyone trained in the doctrines of the Royal Air Force must necessarily agree, and yet the mental shackles imposed by tradition may sometimes prevent this new factor in the conduct of war from being fully appreciated.

In this essay, the writer has been forced to face the necessity of surveying every problem of war under modern conditions from its inception, and not at some arbitrary stage in its development.

A "landing on a large scale" has great historical precedent, but it is only a phase in a campaign wherein an appreciation of the various factors has indicated a good prospect of success in the landing of a military force upon the enemy's coast, in order, eventually, to bring about the defeat of that enemy. It is a truism that, for such an operation, the control of sea communications is essential. Is it not equally true that the control of air communications, or, in the more accepted term, air superiority, is equally essential?

To oppose a powerful air force, securely based ashore, by ship and carrier-borne aircraft is asking too much of the air forces of the expedition. When the air situation so obviously favours the defender of the coast, it is clear that no commanders would recommend, and no government would sanction, a combined landing being attempted.

The writer hopes that he has proved that the situation put forward for discussion in this essay is an unrealistic one. If the enemy has a powerful air force, and we are not within operating air range of his coast, then, until such time as we can establish air bases nearer, and have defeated the enemy in the air, a landing on a large scale will be an impracticable operation.

Furthermore, if air bases are available, or can be secured, from whence air superiority can be obtained over the enemy, it is quite possible that, by the use of that very air superiority, the necessity of landing a military force in the face of opposition may be obviated. The enemy's power may be broken by purely air action, and all that will remain will be for the troops to be landed, without interference, to secure the fruits of the air victory.

In combined operations, more than in any other form of warfare, does the modern development of air power promise revolutionary change. It may be that, in future, except against an ill-equipped enemy, or in very unusual circumstances, the traditional form of a combined landing will cease to have any greater military significance than as an interesting feature of past history.

THE RÔLE OF AIRCRAFT IN WAR

BY FLIGHT-LIEUTENANT E. J. KINGSTON-McCLOUGHRY.
D.S.O., D.F.C., *p.s.a.*, R.A.F.

WARS of to-day are no longer the affairs of kings but of nations, who, rightly or wrongly encouraged by the urge of patriotism, elect to hurl their might one against the other. And though capitulation of an adversary may be indirectly brought about by various means, ultimately it depends on the people themselves whose morale must be so reduced as to force them to call upon their government to make peace.

The defeat of an adversary's armed forces; blockade and starvation; the sapping of a nation's wealth and morale; these are the accredited methods of reducing an enemy to defeat. A consideration of the degree which aircraft can the most effectively participate in each or all these methods is the purpose of this essay.

THE RÔLE OF AN ARMY.

The history of war on land and sea covers many centuries and abounds in axioms as to the general methods by which such warfare should be conducted. History shows that, although the ultimate aim of an army should be the occupation of the enemy country, a necessary preliminary to this is, in most cases, the defeat of the enemy armies. The reason for this is clear. Not only can defending land forces make certain of opposing the advance of an invading army, but occupation necessarily involves dispersion of force. In such circumstances the enemy could not only threaten the lines of communication, but might even invade the country of the occupying army, and furthermore, the moral effect of occupation would lose much of its sting if the enemy people knew that their own armies were still in being. It is an accepted doctrine that the first step of an army in bringing pressure to bear on an enemy people, is the defeat of their main land forces.

THE RÔLE OF A NAVY.

The rôle of a navy is to support the army by the control of sea communications and to a limited extent by bombarding the enemy's coast. The control of sea communications is properly the work of cruisers, submarines and auxiliary craft, but since the converse of the moral of the Big Fleas and Little Fleas has been adopted in warship building, these light forces require heavy ships to support them. It is for this reason the powerful battlefleets of to-day have appeared.

Unlike armies, navies can perform their task without dispersing the

opposing fleet, although it is obvious that as long as the enemy fleet is in being it remains a menace. History furnishes many such instances where navies have failed in their attempt to seek out and destroy their opponents, and yet have controlled seas. The reason for such failure is apparent, whereas armies are tied down more or less rigidly to lines of communication, navies have greater freedom which enables them to avoid action if desired. Thus, control of sea communications with an opposing fleet in being does not necessarily entail the dispersion of a sea force, with its attendant dangers, as would be the case if an army attempted to occupy a country without first defeating the opposing land forces.

THE RÔLE OF AN AIR FORCE.

The history of air warfare is brief and affords mean scope for the drawing of fixed conclusions. In formulating air strategy it is safer, therefore, to build upon the firm foundations of land and sea strategy, to consider how these should be modified by the advent of aircraft, and then to draw comparisons with purely air operations.

We have seen that the strategic aim of the two older fighting services is fundamentally the same, the methods of application alone differing. Armies have first to defeat opposing armies. Navies cannot always succeed in seeking out opposing fleets, but they are so embarrassed by them that every endeavour is made to bring about their defeat, or neutralization, as a preliminary to controlling sea communications. How, then, should air forces apply pressure?

Air forces cannot occupy a country, but they can materially assist in the defeat of armies and in the control of sea communications. Air communications will assuredly develop and become one of the important chains in the highways of the world. The importance of their traffic, however, can never become comparable with land and sea-borne trade. It is clear, then, that although the national life of an enemy may be impaired his will can never be broken by directing the main effort of air forces to the control of commercial airways. Here is a definite difference between the strategy of air and naval warfare. The primary rôle of navies is to safeguard merchant shipping, but there are no commercial airways, nor even likely to be, upon which the life of a nation will depend. Thus, the tasks in which air forces can usefully co-operate are:—

- (a) The defeat of the enemy's land forces.
- (b) The control of sea communications, including the defeat of the enemy's sea forces.
- (c) Exerting direct pressure upon the enemy's national life and morale.
- (d) The defeat of the enemy's air forces.

SHOULD THE DEFEAT OF OPPOSING AIR FORCES BE THE FIRST AIM?

We may well ask if an air force can perform any of the first three of these tasks whilst an adversary's air forces are still in being?

It is clear that an undefeated air force will always constitute a menace to opposing air forces. It cannot be assumed, however, that in view of this menace the first duty of an air force must necessarily be the defeat of its adversary. We must first know whether air forces offer solid objectives against which other air forces can be pitted. If they do we must then decide which of the four operations above would give the most effective results, and whether war could be safely waged against other objectives whilst the opponent's air forces are still in being.

We have seen that fleets cannot always be brought to action, yet, compared with ships, aircraft have vaster powers of evasion because of the greater freedom and rapidity with which they operate. They have no lines of communication from their base and, little hindered by natural or military obstacles, they can approach from almost any direction and at any height up to their "ceiling." Whilst fighter aircraft and ground defences afford some measure of protection both by day and night, the very nature of aircraft places them at a disadvantage in defence. Bombers can concentrate, whereas fighters must disperse. Fighter aircraft cannot remain for any length of time in the air and if they wait on the ground they will often fail to intercept invaders. Even if they succeed in intercepting they have no great arresting power. Doubtless the technique of anti-aircraft defence will develop, but so will the penetration power of the bomber. Thus, although defence may hinder air attack, and no doubt cause casualties, it is utterly impossible to stop hostile aircraft crossing a given line for the reason that the sky is too vast to defend effectively. A further disadvantage is that air defence requires a very considerable force of fighter aircraft, thereby reducing the number of bombers and weakening offensive power.

But defeat in the air is not the only possibility, for an air force spends long periods on the ground during which time it might be effectively crippled by the action of enemy aircraft. Let us then consider the vulnerability of the ground targets of an air force: these are not only aerodromes but bases, aircraft factories, supply centres, etc.

Although an enemy air force cannot retire to safety without completely withdrawing from the theatre of operations, aircraft on the ground are easily concealed. Moreover, they can be moved rapidly from one alternative landing-ground to another, and can operate from great distances. Even if air units are found and attacked it is difficult to cause effective damage to scattered aircraft; the personnel can readily

be provided with cover, and the landing-grounds themselves easily repaired.

Aircraft factories and supply centres may provide excellent targets for air attack, but this danger is lessened by the fact that they might be widely scattered or may lie beyond effective air range and, further, given a good organization, the supply of aircraft and personnel should provide no great difficulty even if heavy casualties were inflicted, not only in the air and on aerodrome but at some factories. The production figure for British aircraft, which amounted to over 100 aeroplanes per day in 1918, indicates the truth of this statement.

Doubtless occasions will arise when concentrations of enemy aircraft will provide ideal targets, but, as a general rule, no great material damage can be assured by attacking aerodromes, though the moral effect may be considerable. Nevertheless, it should not be forgotten that peace-time reserves will be strictly limited. During the first six months of a modern war the necessary replacement of war aircraft and personnel will be difficult, and during this period it might be possible to obtain temporarily decisive results by hitting direct at an enemy air force on the ground.

It can be stated, therefore, that there is no known method by which an air force can be certain of bringing direct effective pressure to bear on an opponent's air force, and that only occasionally will such pressure be effective. But even if new developments and inventions ever should enable air forces to compel opponents to join action it does not necessarily follow that such a course would be the most effective way of using air power.

ABILITY OF AIRCRAFT TO STRIKE DIRECT AT VITAL CENTRES.

An invaluable asset of aircraft is their ability to avoid armies, navies and natural obstacles and to carry the offensive into the heart of an enemy country. They can attack centres essential to an enemy's defence organization and to the continuance of his resistance; they can attack the morale of the enemy people direct. Moreover, an air force runs no greater risk of defeat by striking direct at vital centres than by striking at opposing air forces. The simile of an army attempting to bring pressure to bear upon an enemy people whose land forces are undefeated, no longer holds good. It is as easy for an air force to reach the enemy's vital centres as it is to attack the ground organizations of his air force, there is no dispersion of force required and the moral effect on the people is far greater than it would be if the blows were aimed at their air force. It is not air losses which affect national morale, but the realization that the railway services are paralysed, the food distribution disorganized, and that the heating, lighting, and other essential services of life no longer function.



The Bristol Fighter in India.

(NOS. 5, 20 AND 28 SQUADRONS CONCENTRATED AT PESHAWAR DURING THE OPERATIONS IN 1930-31)



No. 20 (Army Co-operation) Squadron.

(THE LAST SQUADRON TO POSSESS THE BRISTOL FIGHTER ABOUT TO TAKE OFF TO BOMB THE AFRIDIS DURING THE OPERATIONS IN 1930)

In consultation with his technical advisers the statesman must decide where air attacks are to be applied in order to bring the maximum pressure to bear on an enemy people. According to the nature of the campaign, the military and economic situations, and the temperament and mode of life of the adversary, he must decide upon the severity of bombardment and the nature of the targets. There can be no guarantee that the vulnerability of any particular centre will be sufficient to enable air forces to bring decisive pressure to bear upon an adversary. On occasions it might be best to aim at disorganizing the people's daily life by striking at their system of transportation, while at other times a fleet in harbour, congested maritime areas, mobilization centres, munition factories, armies in the field, and air force centres might each or all receive attention. But whatever the objective chosen, one thing is certain—indiscriminate bombardment will never prove effective; all targets must be selected for their military value, and here the term is used in its broadest sense.

AIR SUPERIORITY.

It is not suggested that air forces will be able to carry bombardment into an enemy country without fighting or without expecting reciprocity on the part of the opponent. But it is the act of bombardment alone which will tie an air force down to fight and deflect it from the offensive to the defensive. Indeed, intense fighting and heavy casualties will ensue and it is the outcome of this struggle to reach vital centres which will settle the question of air superiority. Such superiority will be obtained by the side which can maintain bombardment in the face of losses and put the opponent on the defensive, thus forcing him to divert his bombers from attacks on vital centres to defending his own air bases and aerodromes.

Although diversions are to be deprecated they are sometimes unavoidable, as, for example, the use to which fighter aircraft may be unavoidably diverted. Public opinion and the need for deterring invading air forces dictate that a certain force of fighter aircraft must be used in an endeavour to arrest and repulse enemy bombers. The definite rôle of fighters so detailed is to prevent air attacks on vulnerable centres. Air superiority will be gained by air fighting, but the primary purpose of such fighting is to enable other aircraft to reach the enemy's vital centres: it is no more than a means to an end. The main air strength must be hurled against the enemy's vital points, and the minimum fighter strength used to assist in attaining air superiority.

Whether one side will possess such marked air superiority as to enable it to break an adversary's will is questionable. In future wars it is probable that both sides will be able to offer a formidable

opposition in the air, and general superiority will seldom be marked or permanent. No doubt an air force will sometimes gain an ascendancy, thus being able to increase the tactical range of its bombers and reduce that of its opponent: it is equally probable that, at other times, the pendulum will swing and give the advantage to the other side. By far the most common situation will be local superiority, that is, temporary air superiority in some particular area at some particular period. Areas where major army or naval operations are in progress are particular examples of regions where there is need of definite limited superiority.

CO-OPERATION WITH THE OLDER SERVICES.

A consideration of the rôle of aircraft allotted for co-operation with the older services makes it apparent that the main duty is direct assistance by reconnaissances, by spotting gun fire and by giving any other direct assistance as required. Any land or sea operation without some measure of local air superiority would indeed be a hazardous venture, but the fact nevertheless remains true that it is the actual co-operation which is the primary rôle.

Naval operations have been greatly affected by the advent of air power. Sea communications, and congested areas in particular, have now become vulnerable to air attack, and fleets are no longer safe in harbour. The primary rôle of sea-borne aircraft working with a fleet is the performance of the co-operation duties mentioned above. An essential means to this end is the attainment of reasonable local air superiority over enemy sea-borne aircraft. Superiority against enemy shore-based aircraft must necessarily be the responsibility of shore-based aircraft.

CONCLUSIONS.

The true aim of all war is moral ascendancy over the enemy people. We have seen that before armies can begin to apply pressure they must first defeat the opposing armies. Navies can apply pressure without necessarily defeating the opposing navies, but they are so embarrassed while the enemy fleets remain in being that every endeavour is first made to bring about defeat or neutralization.

We have seen that air forces do not generally offer solid objectives against which opposing air forces can direct their main effort. On the other hand, air forces are little hindered by defences or natural obstacles and have the priceless asset of being able to strike direct at the enemy's vital centre with no greater risk to themselves than if they attacked any other objective. The vital centres must be carefully chosen with a view to bringing about the surest and quickest defeat and these will vary according to the actual state of affairs and with

the progress of the campaign ; they may be national, naval, military or air force centres. Intense fighting will ensue from this direct attack and air superiority will go to the side which can maintain bombardment in face of loss and which can force the other to the defensive. Permanent and general superiority will be the exception, but over areas, such as where armies or navies are operating, local superiority may be fairly defined.

The foregoing conclusions refer generally to aircraft operating as an independent force. The rôle of aircraft allotted to armies or navies for co-operation will be direct assistance to those services ; air superiority will be merely a means to this end.

History gives little guidance as to whether modern air forces alone can break the will of an enemy people. There are two schools of thought on this question and a decision will be reached only after the actual trial of war. One thing, however, is certain, the greatest national pressure cannot be brought to bear unless each service applies its maximum effort in correct co-operation with the others.

Finally, we may say that the rôle of aircraft in war can be simlized to that of a projectile fired from a gun. The primary object of a projectile is to cause the maximum destruction at the expense of the enemy. Its targets are chosen for specific reasons. It may be diverted from its main purpose as the need arises, as, for example, to attack other weapons—that is, the guns from which projectiles are fired—which may be causing local discomfiture. One cannot arrest its passage, and it can pass over armies, navies, and natural obstacles. But alone it can seldom, if ever, force an issue ; it needs assistance to secure victory.

FROM GIBRALTAR TO PLYMOUTH NON-STOP IN A FLYING-BOAT

BY FLYING-OFFICER F. C. STURGISS, R.A.F.

ON the 16th September, 1931, the Saunders A.7, a three-engined sesquiplane flying boat, set out from Gibraltar in an attempt to fly non-stop to England. This was the final flight of a cruise which had started from England on the 15th August, 1931. The A.7 had flown by a series of comparatively easy stages from Felixstowe down to Port Sudan. The home-coming flight had been made progressively longer, and culminated in the flight from Gibraltar to Plymouth.

The A.7 arrived at Gibraltar on September 15th. Refuelling operations were commenced immediately on arrival, but owing to several minor mishaps to the refuelling gear, this operation was not completed until after midnight. The complete crew, consisting of two officers, one N.C.O. rigger, two fitters and a wireless operator, slept on board that night. It was only possible to snatch a few hours sleep as a very early start had to be made on the 16th.

An hour before dawn we were up and preparing everything for the flight. It was cold and misty, and not at all pleasant struggling into damp flying kit, hauling up moorings, stowing gear, and doing the many small jobs that have to be done before the commencement of a long flight. But the thought that this was the last leg of a rather arduous cruise, and that we were making for England, encouraged us all and made us forget the many minor discomforts.

We slipped away from our mooring before dawn had broken, and taxied well out across the bay. A gusty easterly wind was blowing, and the take-off was made towards the narrow isthmus which joins the "Rock" to the mainland. The take-off was long, but was perfectly clean, and was very good considering that there were 1,050 gallons of petrol on board.

Taking off in the very early morning is always more exciting than taking off at a more usual hour; one's mind is so apt to distort and exaggerate small detail; everything seems unreal and at times a little nightmare-ish. In the half-grey light of dawn, it was rather alarming to watch the exhaust manifolds turn to a bright cherry red, and glow like the embers of three giant Catharine wheels, immediately below the petrol tanks.

A very unpleasant incident occurred just as we left the water. A heaving line, which had been left on the front cockpit cover, and

not noticed in the bad light before we took off, suddenly flew back over the pilot's seat into the centre airscrew. The pilot caught one end of the line, but he was unable to prevent the Turks Head on the other end from going into the airscrew. It hit with a resounding crack, but after watching the engine anxiously for several minutes for any additional vibration, we came to the conclusion that the airscrew could not have been damaged.

Low clouds and mist were encountered immediately after taking off, and for a short time we experienced very bumpy, unpleasant weather. We were thankful that our breakfast, of a necessity, had been small! Conditions improved rapidly, and after the first hour we were enjoying almost perfect weather. All courses were set from headland to headland, so we did not see a great deal of Portugal's very picturesque coast. Excellent progress was made up to Cape Torinana, Spain's most north-westerly point. An average ground speed of 100 knots was maintained, and hopes rose high of reaching Calshot instead of Plymouth, but those hopes disappeared immediately we turned into the Bay of Biscay. The following wind changed to a strong head wind, and for the first hour after leaving Cape Torinana, steadily increased in strength. We were flying at between 600 and 800 feet, and from that height we could see all we wanted of the immense seas running beneath. We kept our air speed at 85 knots, but at one time our ground speed dropped to 45 knots. We realized that unless the wind abated we should only just get across the Bay. We contemplated altering course to a point on the west coast of France, but upon examining the chart, it was seen that owing to the shape of the bay the nearest point of land lay on the track which we were then making good. To add to our dilemma, the wireless, which had worked so well on all other stages of the cruise, could not get in touch with any station from which we could obtain a weather report. We had to decide whether to keep on our original track or return to Cape Torinana. Without knowing what weather lay ahead, it was not an easy decision to make. However, we decided to keep going and to hope for the best. To our intense relief the wind slowly veered and decreased in strength, and by the time we were within fifty miles of Ushant, it became obvious that with ordinary luck we should reach Plymouth.

Weather reports promised us a following wind across the Channel, but this did not materialize, and the daylight began to fail long before the English coast was sighted. The distance across the channel seemed to us so insignificant compared with the total distance, that, when we arrived off Ushant, we began to consider the flight as good as over.

At 1800 hours a thin, black line appeared on the horizon looking

for all the world like the coast. We strained our eyes to make certain, when, without any warning at all, the port engine failed. To our great relief it continued to windmill quite smoothly at 600 revolutions, and we found that we were able to maintain height by only slightly increasing the revolutions on the other two engines, and also the excellent rudder-control made it easy to maintain a steady course. The black line on the horizon proved to be a cloud, which hid the coast until we were within a mile or so, but at long last the coast did come into sight. In the rapidly-failing light, we failed to recognize Whitesand Bay; we were two miles to the west of Plymouth, but flying as we were at only 400 feet, Rame Head completely obscured the town and harbour lights. As a result we unfortunately turned to port instead of to starboard, and flew down as far as Fowey before realizing our mistake. By that time we were all feeling the strain; it seemed such bad luck if we failed to reach Plymouth after getting so near. We were worrying more about the light and bad visibility than about running short of petrol, for we still had at least two hours' fuel left. We flew back along the coast and at last rounded Rame Head. I, for one, will never forget the relief felt when those lights of Plymouth Hoe came into view. There remained only the landing. The bad light and calm surface gave difficult conditions, but by flying on and "feeling" the surface, we landed safely within the Sound.

Upon examining the centre airscrew, the one that had been hit by the heavy line as we took off, we discovered that one tip was very badly damaged, and that the blade was split for some two feet of its length. It most certainly would not have stood up to very much more flying. We felt that after all the fates had not been too unkind.

Thirteen and a half hours continuous flying had tired us. However, we were happily tired in the knowledge that our flying boat had completed the first non-stop flight from Gibraltar to Plymouth, and by so doing, had brought the All Red Flying Boat Route to the East one step nearer completion.

BALLOONS IN WAR

BY CAPTAIN J. MORRIS, B.A., A.F.R.A.E.S.

ALTHOUGH a Chinese General, Han Sin, is credited with having employed kites as a means of communication with a besieged town some two-hundred years before the Christian era, the first authentic appearance of aircraft in action dates from the French Revolutionary Wars at the end of the eighteenth century. In 1783, the year of the "Peace of Versailles," the brothers Montgolfier made a surprise conquest of the air by producing the first passenger-carrying balloon. The basic idea of their invention was derived from the ascending powers of hot air. The bag of their balloon was made of linen, and lined with paper; it was inflated with hot air generated by the combustion of straw and chopped wool in an open grate or brazier, suspended from the neck of the envelope. Their achievement was, however, immediately overshadowed by M. Charles, who substituted hydrogen for hot air as the means of sustentation.

It was Guyton du Merveau who suggested the use of the balloon to the Committee of Public Safety, and the initial trials were so successful that a regular balloon company (*Compagnie d'Aérostiers*), was formed, and a school of ballooning established at Meudon. The first military balloon, the *Entreprenant*, was used in 1794 at the sieges of Maubeuge and Charleroi, and at the battle of Fleurus, where the defeat of the Austrians was ascribed to the valuable information derived by the French general from the captive balloon. Nevertheless, Napoleon abandoned the use of balloons, and closed down the school at Meudon. According to Roger Wallace, K.C.,* Napoleon "evidently considered that the difficulty in filling the balloons and transporting the apparatus for this purpose was not worth the trouble, more especially as France could have no monopoly of such a service, and possibly it would only enable other nations to cumber the strategy of which he was such a master." Mr. W. F. Reid † says that Napoleon appears to have been stricken with the superstitious fear of the balloon which had been attributed to his enemies. "At the coronation festivities in 1806 Garnerin built a large balloon, profusely decorated, with a car shaped like the Imperial Crown. It was liberated in Paris near Notre Dame, and the next morning passed over Rome and fell into Lake Braccanio. On the way, however, it touched the ground, and the crown was broken against the tomb of Emperor Nero. When

* *Journal of Aeronautical Society*, January, 1914.

† *Ibid.*, October, 1910.

Napoleon heard of this ill-omened occurrence, Garnerin was dismissed and came to England. The balloon is still preserved in the Vatican at Rome."

Carnot used a captive balloon at the siege of Antwerp in 1814. In 1849, at the siege of Venice, the Austrians attempted to use free balloons for the purpose of dropping bombs on the town. The bombs were attached to the balloons in such a way that, after the burning of a certain length of safety-fuze, the connection was severed and the bombs fell. When the balloons rose, however, they entered an upper air-current travelling in a different direction from that below, and many of the bombs burst in the Austrian lines whence they had started.*

In the American Civil War (1861-1865), a regular balloon service was established, as also in 1866, in the war between Paraguay and Brazil. During the siege of Paris, in the Franco-German War (1870-1871), the French utilized a free balloon service as an air mail passing over the German lines, and for the transportation of important personages. It was by this means that Gambetta was conveyed from beleaguered Paris to Montdidier. Of the sixty-four balloons employed, five were captured by the enemy, and two were lost at sea. In all, ninety-one human passengers, 363 carrier pigeons and 3,000,000 letters, weighing about 22,000 lb. were conveyed by air from Paris. This service was so effectual that the Germans constructed special anti-balloon guns, while Bismarck decided to consider the use of balloons as contrary to the rights of nations and to treat aeronauts as spies.†

Balloons were used by the French in the Tonkin Expedition of 1882, and at Bac-Ninh and Hoang-ho in 1884. In 1884 a balloon detachment was included in the British Expeditionary Force to Bechuanaland, and in the following year a balloon unit was sent on service to the Sudan.

During the South African War (1899-1901), observation balloons were used with conspicuous success. For example, it was from a captive balloon that the discovery was made that the British troops were about to march into a death-trap at Spion Kop. At Fourteen Streams a balloon worked for a fortnight with only one inflation. Colonel Arthur Lynch, who served with the Boer Army, said: "The Boers took a dislike to the balloons. All other instruments were at their command; they had artillery superior for the most part to, and better served than, that of the English; they had telegraphic and heliographic apparatus; but the balloons were a symbol of a scientific superiority of the English, which seriously disquieted them."

Balloons were again used in the Russo-Japanese War of 1903-1905.

The spherical balloon, however, suffered from severe disabilities. In windy weather it would spin round and become unmanageable, and

* Mr. W. F. Reid, *Journal of Aeronautical Society*, October, 1910.

† Roger Wallace, *Ibid.*, April, 1914.

could rarely be depended upon to attain a height exceeding half the length of the cable. To overcome these difficulties, Lieutenants von Parseval and von Sigsfeld, of the German Army, invented, in 1894, a captive balloon capable of resisting strong winds. Called the *Drachen*, it was sausage-shaped with an air rudder at the rear. At both sides of the after portion there was a wind sail for the purpose of maintaining longitudinal stability. Later, a long and clumsy string of parachute streamers was added to act like the tail of a kite.

With the development of the airship and the advent of the aeroplane, balloons fell out of favour for war purposes, but were retained for training and emergency use. In the early part of the Great War a *Drachen* balloon was procured from the Belgians by the R.N.A.S., who made drawings of it, and from these the first British kite balloon was made. This was installed in H.M.S. *Manica*, and on the 27th March, 1915, was dispatched to the Dardanelles. The work done by *Manica's* balloon was sufficiently effective to establish the value of kite balloons in naval operations.

Soon after kite balloons were taken into military use, the first section to operate with the army in France being provided by the R.N.A.S. in May, 1915.

The *Drachen* balloon, although a great advance on the old spherical, had certain disadvantages. In high winds it was not sufficiently stable, and the tension of the flying cable was considerable. It was, therefore, limited to flying under fair weather conditions.

During the autumn of 1915, Captain Caquot, of the French Army, brought out a kite balloon of streamline shape, provided with a large tapered air-bag, which passed right round the stern to form upper and lower stabilizing fins. The parachute tail, which in the case of the *Drachen* had proved such a marked drawback in naval work, was abolished. A later improvement was a tail consisting of three air-inflated fins, set at 120 degrees to each other, and in this form the Caquot kite balloon became standardized.

Whereas at the beginning of the war the *Drachen* could not work in winds above 28 m.p.h. and could only attain a height of 2,000 feet, at the end of the war, Caquots were flying in winds of 60 m.p.h. on land, and at heights of 7,000 feet, while for naval purposes they were flown at 2,000 feet in relative winds of 90 knots.

On land, kite balloons proved valuable for artillery observation and local reconnaissance of the enemy forward areas. At sea, they were employed largely in convoy escort work, chiefly for the detection of enemy submarines below the surface. No opportunity was afforded of testing their value in a fleet action, although subsequent to 1916 they were always carried when the fleet proceeded to sea.

Aprons, composed of steel cables and supported by kite balloons,

rendered enemy air-raids on London increasingly difficult and their results less effective, while, after the Armistice, kite balloons proved valuable in mine-sweeping.

Another use of balloons in the war was for the purposes of the distribution of propaganda leaflets. At first these were dropped by aeroplane, but when the Germans sentenced two British airmen, captured while performing such duties, to ten years' penal servitude, the use of aeroplanes was discontinued for this purpose. The free balloon, however, proved a convenient alternative. The propaganda balloon was made of doped paper, its capacity being some 100 cubic feet. The load consisted of some 500 to 1,000 leaflets, which were released in batches by the burning of specially-prepared cotton wick, similar to that used in flint pipe-lighters. Although runs of upwards of 150 miles were possible with the propaganda balloons produced at the time of the Armistice, the bulk of the leaflets were distributed over an area of from ten to fifty miles behind the enemy lines. The prevailing westerly wind in France, so disadvantageous to our airmen, proved extremely favourable for the dispatch of the propaganda balloons.

WITH THE EASTERN ARAB CORPS

BY SQUADRON-LEADER A. ROWAN, R.A.F.

(*Photographs by the Author.*)

THE Eastern Arab Corps of the Sudan Defence Force is to hold its manœuvres, with Aircraft No. 47 Squadron co-operating. The scheme lies before me. Not one of those ready-made schemes, in which the conclusion is foregone, and in which the umpires help to arrange a set-piece finish. A real "he-man" scheme, in which anything may happen to either side. The area is in Kassala Province, almost on the border of Iretia and Abyssinia, the area where the river Setit joins the river Atbara, which flows on to join the Blue Nile. Above all, right up against the game reserve where the kudu, elephant, ariel and many other game animals live protected.

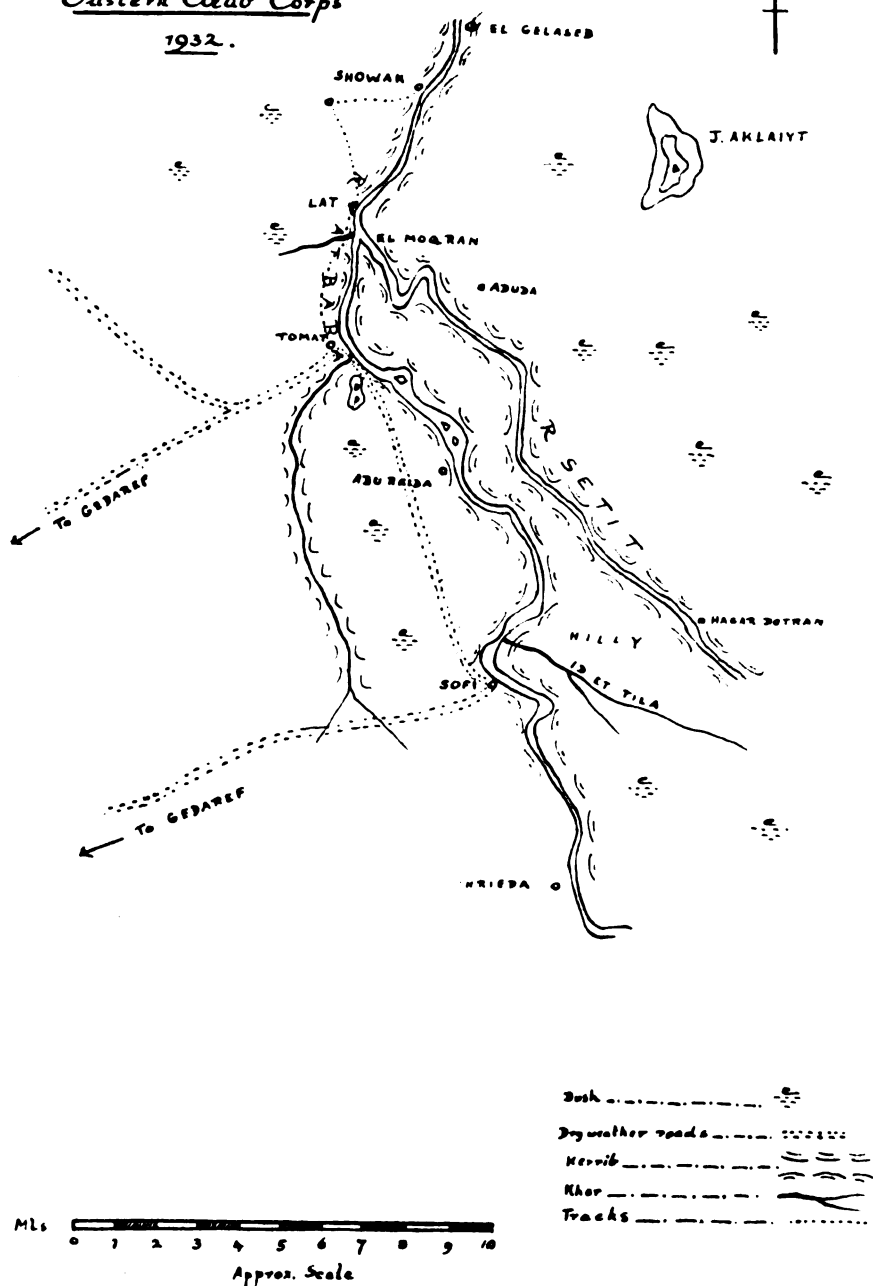
It is impossible to dwell on the wonderful journey up the Nile to Khartoum, when the evening sun lights up the red granite rocks; where the native *gyassas* with their broad sails, wend their way home in the dying evening breeze. Nor must we halt at the temple of Rameses II, or the landing place of Gordon's relief troops—Korosko. The night has fallen; we are in the "Land of Kush," and low on the horizon to the south hangs the Southern Cross.

Outside the hangars of No. 47 Squadron at Khartoum, the aircraft for the special flight are ticking over. All my kit is aboard; camp kit, first-aid outfit, mosquito net, and maps. Nothing has been forgotten—we hope—certainly not the camera and a note book. The aircraft take-off and turn up the Blue Nile to Wad Medani. Unpleasant looking desert until suddenly, ahead, appears the Gesira, a gigantic area under cultivation for cotton. A marvellous system of canals, with European bungalows dotted here and there, and tennis courts close by. After leaving Wad Medani the country changes. Low scrub and *tallah* gum trees. We are passing into the area of the river Rahad, and suddenly a herd of ariel dart away out of a *Khor*. Soon we strike the single-line railway to Gedaref, passing through flat country covered with wild *bamia*. It is not long before the Gedaref *jebels* loom up, and then the village *tukles*,* and then the combined polo and landing ground.

We are in the country of the Beni Amr, a Hamitic people (who were not always Mohammedans) allied to the pre-dynastic Egyptians. To the uninitiated they appear to be Hedendoa, or fuzzy-wuzzies from

* Thatched mud huts.

Manoeuvre Area
Eastern Arab Corps
1932.



the Red Sea Province, for their hair stands up anyhow off their heads. They carry the spear, and are partly pastoral and partly nomadic. A great many of them are camel drivers, plying on the camel routes to Kassala and Iretria. Two hundred years ago the whole of this part of the country was governed by the powerful Fung Dynasty, and occasional relics are still to be found along the river courses.

Gedaref is a large village of thatched, circular *tukles*.

Overlooking it is Military Hill, the H.Q. of the Eastern Arab Corps. Here are the splendid buildings of the Mess and the living quarters, delightful, airy bungalows. The Mess contains many interesting trophies, about the oldest being a silver cup presented by Slatin, the Mahdi's prisoner. On the wall hangs the colour of the original Arab Battalion. Through the enterprise of a Levantine trader, breakfast rolls ice, and soda water are made possible. The library in the Mess can only be described as first-rate. It is time for a bath, and a change into Mess kit—white tennis shirt, grey flannel trousers, a cumberbund, and a sleeveless pullover. A whisky and soda in easy chairs out in the open, with a young moon, the brilliant stars, and the Southern Cross. From the village below, the faint sound of tom-toms and the high-pitched “aye-yai-yai” of the women accompanying the music for a dance.

The conversation turns to the coming manœuvres, and what the “enemy” is likely to do. Here is the scheme. About one hundred and fifty camelmén of the Hadendoa from Kassala have decided to come down and join with the Falata, south of Sofi on the Atbara, and cause unpleasantness to the Government. The object of the Red Force is to prevent this. A word here about the Falata. Highly fanatical Mohammedans from the west—*i.e.*, French Equatorial Africa and Darfur—they wander across the Sudan making for Mecca, determined on a *hadj*, the great pilgrimage. Through lack of funds, sickness, and other causes, they get to a certain point, and then can go no further, so they settle down where they find themselves, and wait. Very often it is only a succeeding generation which moves on a further stage, or the remainder of the way. These people form a high-inflammable element in the Sudan owing to their fanaticism. There is a large settlement of them at Gedaref, where hundreds of their women-folk may be seen packing the *tallah* gum into gunni bags, prior to export. It is curious to realize that the gum they are packing on the borders of Iretria, finds its way at last into our mouths in England, in the shape of ju-jubes.

To return to the “war.” The great question is, which way is the Hadendoa chief going to take? He has a choice of two sides of the river. The country is well-known to the Red Force Commander, who has studied the easiest route, the quickest route, and the likely pace

of the camelmén on these routes. In fact, he has made a careful appreciation. So did the Hadendoa leader, and both appreciations are known to us, the Directing Staff. The Red Force Commander decides he will move out to Sofi, north of the Falata, and hear what his aircraft report. He calls for an air appreciation from the Flight-Commander. It is suggested that as there are no opposing aircraft there can be no air appreciation, but the Flight-Commander prepares an air plan for his three aircraft. As there are no opposing aircraft, all his aircraft are available to further the plan of the Military Commander. He has only three, and dispersion of effort is to be avoided. He concludes that the Hadendoa leader is the instigator of this movement, and that with the destruction of this force, the Felata will remain docile. He, therefore, suggests that both his reconnaissance and bombing shall be devoted to the Hadendoa and their destruction. This was a sound



fig. 1.

SHOTAL

conclusion, as the Military Commander might very well have asked for the bombing of the Felata as well. This would have meant a dispersal of air effort, and a strain on the flight resources, and would not have been the best method of achieving the aim. The Red Force Commander approves the plan, and at six next morning the *Idaras* * of the Red Force move out against the rebels. We are out on our Kordofan arabs to see them off, and to see the reconnaissance aircraft off. The *hamla*† camels have gone, and the *Idaras* of mounted infantry are starting at a steady pace with flags flying—one in front of each *Idara*. The standard of the Eastern Arab Corps has the *Shotal*, i.e., the knife of the Beni Amr embroidered on it.

This knife is carried in a leather scabbard on the hip, and is used for skinning game, for cutting and for fighting. At certain festivals it is used in mock combat, when it must be held by forefinger and thumb only. The standard-bearer, and also the flag-bearers, are proud men. To them it means a great honour, and the "glad eye" from village belles. The column is moving off past the landing ground, down the Gedaref—Sofi road, with their women-folk saying farewell with their high-pitched "aye-yai-yai." The march is to be done in a manner characteristic of the Arab Corps; a method, as will be seen, which makes aircraft reconnaissance difficult, to say the least of it. The column marches until the sun is well up, and then *beits*.‡ With

* Companies.

† Baggage.

‡ Lies up for the day.

the setting of the sun the column gets ready to move, and to *makluta*, i.e., a night march in three stages, during which considerable distances are covered. Next morning, the column, as the sun rises, proceeds to *beit* once more. The natives of the country do the same sort of thing, and it will be seen how difficult it is when ordinary men lie up in the shade of the trees and let their camels graze, to spot a particular group from aircraft, even when flying at 1,000 feet.

The Red Force has gone with its few umpires, and the Directing Staff, after a conference and lunch, move out to Tomat, a small village further down the Atbara, and between the enemy and the Red Force. The first part of this interesting journey is over a cotton soil track; a dreary enough country with tall grasses, mostly wild *bamia*. This grass has a strong stem, and produces thin, long pods with small leaves. It is frequently eaten by the inhabitants "faut de mieux." Suddenly the aspect changes. Still flat country, but we are entering a forest—one of the most amazing sights it is possible to see. It is a forest of the *tallah* gum tree, interspersed by occasional *hashab* gum trees, thorny acacia, and mimosa. You must imagine a leafless forest in which all the bark of the trees is a light yellow! Here and there the wet brick colour of the *hashab* tree. Hanging from the thorny twigs of the acacia, dozens of weaver birds' nests. The total effect is utterly bizarre, and gives the impression of an Aubrey Beardsley forest inhabited by sinister ghosts. To add to the effect, overhead soars a huge white vulture with black wing tips.

After about twenty-five miles we enter the *kerrib*, and the whole scene changes again. The *kerrib* is that peculiar terrain on either side of the rivers, which makes one think twice before going through it, unless there is a definite path. It varies in depth. In places three or four miles, in others only two or three hundred yards. There is not a level stretch in it. Continuously undulating, a succession of high humps of gravelly sand, and entirely covered by *shôk*,* one can be lost in it very soon. It is the home of many wild animals and birds, and above all, of the guinea fowl. Suddenly we come across about 150 of them running away. Two shots, and a plump brace have been secured for the pot. Of all the *shôk* the worst is undoubtedly the *kitta* bush. I am sorry to say it is extremely common. It is taller than a man, and its thorns are the shape of fish hooks, which tear one's clothes to ribbons. The camel, however, seems to enjoy eating it, and it leaves no mark on the elephant's hide.

Then suddenly, with no warning at all, one is looking down on the river Atbara, an incredible blue, even in the light of the sinking sun; a river which in a month's time will dwindle into pools, to which innumerable birds and beasts will come to drink. Even now, as I am

* Thorny scrub and bushes.

standing by the river bank, I am amazed at the number and variety of birds which have come for their evening drink; doves, literally hundreds, waders of every description, parakeets, enormous crows with white collars, cranes and numberless tiny birds. On the opposite bank a curious procession is wending its way to the river bank, a family of rock baboons. They are coming down from the *kerrib* with extreme caution, one behind the other, and after their drink they solemnly turn round and walk back—one behind the other. The water looks too tempting, so I have a bathe, taking care to avoid a good looking pool. I would rather have a dinner than be one. On my return to the *tukles* I find the well-trained Somali servant has put out everything to perfection, and is ready to help me to change. Whilst away, a reconnaissance aircraft has dropped a message to say that no enemy has been located. Dinner in the open, under the stars, is delightful, and the guinea fowl are done to a turn. From the village comes the sound of tom-toms and the occasional bark of a dog.

It is half-an-hour before dawn. I hear a faint whirr of wings and a rasping cry. It emanates from the *rahu*, or, as we call it, the Demoiselle crane. Hundreds are passing from the river, making their way to an early breakfast in the *durrah* * fields. This crane is undoubtedly one of the most delightful of eating birds, and, as the dawn breaks, I can see "M.B." getting up with his gun in hand, and I know we shall enjoy an excellent dinner that night. As we are sitting at breakfast we can hear the reconnaissance 'planes on the wing, and, advancing towards us a figure followed by another, carrying a tray. This is the village *Omdah* or headman, who is coming to pay his respects with a pot of coffee and three cups. "M.B." and he discuss topics of interest in Arabic, after we have exchanged formal greetings. It is time to be moving. The *showish* † in charge of our camel escort, who is also the standard bearer, is standing ready with our camels—magnificent *Bisharin* trotting camels of the Sudan Defence Force. Armed with camera and *chabuk*,‡ we mount on the most comfortable of saddles, the *maklufa*,§ and we are away on our seven-mile jaunt to visit the Red Force at Sofi, up the river. At the end of Tomat village a small crowd is gathered, and two men come towards us dragging a python, just killed. We halt and get off, as he seems exceptionally large. Careful measurement shows him to be ten feet in length. On again through the *kerrib* of *kitta* bush and *la'ob*, an evil-smelling thorn scrub, and so into the bush. The escort has heard that the Setit herd of elephants have crossed the rivers Setit and Atbara, and is somewhere about. Very soon the standard bearer says "Elephant!" and we can see their spoor on the mud track. It is some time later that we hear a

* In Egypt this means maize; in this part of the Sudan, millet. † Sergeant.

‡ Camel Whip.

§ The officer's riding saddle.



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CAMPING UNDER THE *SANT* TREES ON THE BANKS OF THE ATBARA.



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THE OFFICER COMMANDING AND STANDARD BEARER OF THE EASTERN ARAB CORPS.



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IN THE GAME RESERVE, ON THE RIVER SETIT.



[Copyright reserved.]

A TALLAH GUM FOREST ON THE BORDERS OF ABYSSINIA.

shrill "trumpet" to our right, and the crackle of breaking branches. The camels show signs of restiveness, but all is well, and we emerge into an open plain cultivated with *durrah* and *bamia*.

The Red Force has made its headquarters at the Rest House, 150 feet above the river. Almost opposite is a high rock on which hundreds of baboons are sunning themselves; below, the silent river with its crocodile pools. The *Idarus* with their picquets are quartered round the Rest House amongst the magnificent and shady *sant** trees which grow here. On an open space close to the Rest House is the message-dropping station, and the Force H.Q. W/T lorry. The W/T station has been in communication with the reconnaissance aeroplane, and up to now only negative reports have been received. A large number of camels have been reported, it is true, particularly in the J. Akelaiyit area, but the Red Force Commander has decided that these cannot be the enemy. He has come to the conclusion that owing to the habits of the enemy, his best chance of finding him is to keep his aircraft on reconnaissance to the latest possible moment of daylight. A W/T order is sent to the landing ground at Gedaref to that effect. The Red Force Commander also decided that he will stay at Sofi until definite aircraft information is received.

On our way back to Directing Staff H.Q. we pass some very fine looking tall plants with white flowers and what appear to be light green apples. This is the *asshar* plant, one of the most poisonous in the Sudan. One speck of its thick, white "milk" in the eye spells total blindness. The "apples," which look delightful, contain nothing but thin fibre. At one time Germany tried to use the fibre for the making of tapestry, but the texture turned out to be brittle and unsuitable. In most of the villages one passes, the thatched, circular roofs of the *tukles* are covered by creepers, the *garas* which provide the villagers with ready-made water receptacles—the gourd being the shape of a bottle with an enlarged base. As the sun is setting the reconnaissance aircraft are passing over our headquarters on their way home. A message is dropped—an ever-recurring joy to the *showish*, who is very proud of his knowledge of laying-out ground strips. He has become very efficient at it, and lays out the "W" with great alacrity, to show the message has been received. It is a good message; about 150 camels are grouped in a suspicious manner in the neighbourhood of El Geilased.

Early next morning we are off to Sofi once more. Here everything is bustle. The Red Force Commander has received reports from his aircraft confirming the previous message that about 150 camels are located near the East-side of the river, North of Showak. The Force

* A tree of excellent hard timber, which the white ant will not touch. Used for the building of boats and *saggias*. It can stand months of flood inundation.

Commander has decided to move his Force forward to the Mogran—which means juncture—and to prepare to meet the Hadendoa leader there. We, therefore, return to Tomat and receive news of lion. Six or eight are reported on the West bank of the Atbara, near Showak. Unfortunately, we are not on a shooting expedition, and so have not the time to go so far. Whilst wandering down to the river we notice two interesting trees. The one is thorny, and has small red berries. It is the *nabbak* tree, and is supposed to be the manna of the wilderness. Whatever it may be, the berries, when eaten, taste just like sweet bread, and are, in fact, eaten by the inhabitants. Another curious tree is the *luban*. The bark is yellowish and peels off like bits of paper. It has no leaves, but grows flowers at the end of its twigs during spring. It looks as if it was dead, and had died from some unpleasant disease. It blows over and snaps in a high wind! It is, however, the frankincense tree of scriptural renown, the aromatic resin still being used as an ingredient in the manufacture of incense. As we approach the river bank with a rocky pool below us, we can see three crocodiles slither off the rock into the water. The sun is setting and the *hamla* camels of the Red Force are coming along at a swinging pace. It is interesting to note how much faster camels will move along after sunset. It is roast *rahu* for dinner, out under the starlit bowl of Heaven, and very good it is too; the flavour somewhere between chick and turkey. Returning aircraft report the suspicious camels just North of Showak, and close to the river.

Next morning we are up early and away to the Mogran. A mile or two of *kerrib*, then a *khori*. Following the *khori* to the river bed we can see the Force W/T lorry on a magnificent, flat, pebble beach, large enough for any aircraft to land on, into the wind blowing to-day. In fact, all the Mogran bed has similar patches at intervals. I am wondering if the Force Commander will take advantage of the fact? The Force H.Q. is nicely perched on the high river bank under a *sant* tree, with a canvas awning fastened to the branches. We decide to move on, and explore the river-bank to Lat and Showak. Possibly, we may come across the enemy *beiting* on the East or opposite bank, and so make certain of the advance. We push our camels to an eight-mile-an-hour trot—not a comfortable pace.

No sight of the enemy.

Just South of Showak we cross the river, and suddenly, in an open hollow in the *kerrib*, we see a magnificent specimen of the greater bustard, a much-coveted bird. Later on, hundreds of guinea fowl come to view, and we can hear the crackle of antelope moving through the scrub.

At Force H.Q. once more. After three full hours on the camel, I am somewhat sore and very thirsty. Excellent cool water and lime juice

is to be had, and then a refreshing bathe in the cold waters of the Setit.

The Red Force Commander has decided to stay where he is, but is sending out an M.I. patrol towards J. Aklaiyit to clear up the conflicting reports from air and ground sources. Ground intelligence has given the definite impression that the enemy is advancing by J. Aklaiyit, whereas air intelligence gives the enemy location as at Showak. Meanwhile, the heat of the day is increasing. Hundreds of doves are flying to the river for their mid-day drink. Suddenly, a messenger arrives and says that he has seen ariel. The Red Force Commander, although hot and weary, seizes his rifle and disappears. Presently two men stagger in with a magnificent specimen of this antelope, with the hocks slit to facilitate carrying, done in a most professional manner, slit by the shotal.

The Red Force Commander is not satisfied with his information, and I wander down to the W/T station with him. Here we see that useful method of inter-communication in use; the ball and arrow Code. A reconnaissance aircraft is overhead, which carries no wireless. The Red Force Commander has ordered the white ball and arrow to be put out, and gives the pilot instructions—by this simple but excellent method—to search a certain area and report. The machine acknowledges receipt of the orders, and is gone. We return to Tomat, knowing full well that by the following dawn battle will have been joined, or—the Hadendoa will have been successful.

Out in the open we have gone to sleep. The young village maidens have been and delivered milk for our morning tea to the cook. The youth with fresh eggs has gone. Above, the young moon and the brilliant stars, and around, silence. Only at the back burns the fire, around which the camel escort are sitting bunched. It is midnight. Suddenly, without the slightest warning, I am shaken. It is a matter of seconds, and I am peering into a face covered with drapery. A voice says "Who are you?" I reply, "Directing Staff," and the figure dashes away. I look round and see barracked camels and dim figures everywhere. It is the enemy who crossed the river at Showak, and are speeding on their way to join the Felata. They have hacked their way through three miles of *kitta* bush, and are weary. No wonder. When it is realized that this means about one mile in the hour, one can understand the nature of this arduous task. I can hear voices. The Hadendoa leader is talking to "M.B." I, too rise, and join the party, not averse to a small drink at midnight under the Eastern stars.

It is necessary now to change the narrative, and to give the Red Force Commander a chance. It is only a matter of minutes. The enemy is gone, and a camel orderly is standing ready to take a message through the *kerrib* and over the river to our Force

Commander. How he ever got there is a mystery. However, this was the message: "The village headman at Tomat states that at midnight a strong force of Hadendoa reached his village. After doing considerable damage they passed on, going South." What more is there to do? Nothing; so I continue my interrupted sleep, for, as I heard years ago, a good soldier sleeps when he can, and eats whenever he can, and no advice could be sounder.

At sunrise, looking down towards the river, I can see the Red Force mounted infantry passing out at a good pace. It will be touch and go, now, as to who wins. What of the aircraft? The Force W/T has managed to get through the Gedaref landing ground with approximately these orders: "Enemy reliably reported at or moving South from Sofi area. Locate and destroy by bombing. aaa. Our Forces will have reached Tomat at 06.00 hours in pursuit. aaa."

Here is the interesting finale to the manoeuvres. After a magnificent ride by the M.I. doing twelve miles per hour over difficult country, the combined attack ended the Hadendoa rebels. The aircraft located the enemy in suitable terrain—a *chor*—just as the mounted infantry reached them. The Hadendoa leader put up a fine rearguard action, but the odds were too great. The accurate low bombing of the aircraft *on suitable ground*, combined with the rifle fire of the M.I., prevented an awkward contretemps for the Government.

There remains only the return to Gedaref, and the usual conference at which the Chief of Staff of the Sudan Defence Force summed up very ably. He also pointed out that the difficult task of air reconnaissance had been very successfully carried out.

KURDISTAN AND THE KURDS

BY W. MORGAN, LEADING-AIRCRAFTMAN, R.A.F.

(Photographs by the Author.)

Of the four recognized political areas of Iraq, which consist of:—

1. Kurdistan,
2. The Southern Desert bordering on the Nejd,
3. The Middle Euphrates, and
4. The City of Baghdad,

Kurdistan plays by no means a small part in the internal affairs of the country, and it is towards Kurdistan, therefore, that these comments are directed.

Kurdistan, generally speaking, may be regarded as that area lying between the two Zab rivers (*i.e.*, the greater and lesser Zab). In shape, the area is not unlike an oblong lying in a south-east and north-west direction—the Persian and Kurdish mountains forming the long side of the rectangle, and the river Euphrates and the desert cliff (from which the name Iraq is said by some to be derived) forming the parallel boundary on the short side; the whole being intersected by the river Tigris, which sinuously winds its course down the centre.

The main towns of Kurdistan are Mosul, Arbil, Rowanduz, Koi Sanjak, Altun Keupri and Sulaimaniyah, of which Mosul is the recognized main centre.

Mosul (the scene of the Turco-Iraq Frontier Commission's activities during 1925) is separated from Lower Iraq by a long range of hills known as the Jebel Hamrin or Red Hills, which originate somewhere in the region of Ahwaz, running north-west without hardly a break for some 350 miles or so, until the range fades away into the desert west of the river Tigris, not far from Mosul itself. This bare, serrated ridge of red sandstone, which rarely rises more than a thousand feet above the surrounding country, forms an excellent land-mark for the guidance of aircraft flying from Baghdad to Mosul and/or Kirkuk, and *vice-versa*. Beyond this range the country becomes more undulating, and the nature of the ground more stony—the presence of trees of any description being rare.

A similar series of bare ridges are next encountered with rolling plains between, until at length, a few miles east of the towns of Kirkuk, Altun Keupri and Arbil, the great plains disappear and the tangled foothills are first met; then follow the great crested mountains which

culminate in the vast range which overlooks, and overawes, the Persian Plateau.

Arbil lies approximately mid-way between Mosul and Koi Sanjak, which, in its turn, may be said to lie directly north of Kirkuk. Sulaimaniyah is situated approximately in a slight north-easterly direction from Kirkuk.

THE KURDS.

The Kurds are an Aryan race, and are supposed by some to be identical with the ancient Medes. The most famous historical Kurd ever known was the great Saladin or Salah ud Din, who once made the town of Arbil his capital city, although, in modern history, the greatest Kurd might well be said to be Shaikh Mahmoud, one-time Governor of Sulaimaniyah, and "Pretender to the Throne of Iraq." This notable has, for some time past, been a continual source of trouble to both the Government and the Rogzhadi Jaf migratory tribe; the former by his antagonistic attitude, and the latter by his heavy taxation on cattle during the migratory period. However, his final apprehension and subsequent deportation to the south, has greatly improved the situation in general.

In origin, the Kurds were all hill people, although at the present time the race comprises hill people and plain dwellers.

The majority of the Kurds are adherents to the Shiah religion, being of the opinion that the Shiah sect, as opposed to that of the Sunni, are the orthodox Mohammedan denomination.

There are two classes of Kurds—the "agha" (rich man), and the peasant. The peasant averages five feet six inches in height, and possesses features that are typically Aryan. The hair of the peasant is normally of a black or dark brown colour (though there are exceptions to this rule), and the beard is allowed to grow. The head is usually kept shaved except for a small fringe, and the complexion is of light olive colour.

The peasant's dress invariably consists of a white cotton shirt with long sleeves, baggy cotton trousers, and a black quilted coat which crosses over in front of the stomach to be finally tucked into the top of the trousers.

Around the waist is wound a long piece of printed calico, which is interlaced, and normally of a combination of blue and black in colour (the blue being regarded by most Mohammedans as a deterrent to the "evil eye" or "aswad aina" (black eye) as it is more commonly known).

In length, this belt (for such it might be termed), may be anything from three to fifteen yards long, and when fully laced up may often reach from the waist to the armpit.

The head-dress consists of a skull cap, around which is loosely wound one or two silk or cotton scarves. In the hills, the peasant wears a conical-shaped cap surmounted by a tassel.

A similar dress, but of a more costly and brighter colour, is worn by the " agha." He is also a far finer type than the peasant, being the proud possessor of fine aquiline features, and averaging some six feet in height. It is said that the " agha " cannot manage a camel, but that he pays a domesticated Arab to look after his interests in that direction.

All Kurds, with few exceptions, are reputed to be the owners of virulent tempers, which may not always be in evidence but are there nevertheless.

THE KURDISH TRIBES.

A tribe may be said to be a community (or a confederation of communities) which exists solely for the protection of its members against external aggression (or " fancied " aggression in many instances), and for the maintenance of the ancient rituals and standards of life. The larger tribes are usually divided up into sections, which, in their turn, are re-divided. (This is evident in the Bilbas confederation—a tribe that is re-divided into some seven or eight sections.)

In the interests of existing regulations in general, and taking into consideration the diplomatic policy of foreign countries, it is not proposed to enter upon a full discussion regarding the habits, strength, location, and political activities of the many Kurdish tribes, but for the sake of readers who may be anxious to glean some slight knowledge of the existing tribes of Kurdistan, the following list may be helpful.

LIST OF KURDISH TRIBES.

The Ako,	The Khushnao,
The Balik,	The Kora,
The Baradost,	The Mamash,
The Barzanis,	The Mangur,
The Bilbas,	The Piran,
The Boli,	The Pizhder,
The Darbandlis,	The Pizhgali,
The Dizai,	The Saralu,
The Girdi,	The Shirwan,
The Hamawand,	The Shikak.
The Haruti,	The Surchi,
The Harki,	The Zarari,
The Khailani.	The Zibaris.

ARABIC TRIBES OCCUPYING KURDISTAN.

The Jubur,

The Tai.

There, no doubt, many more tribes exist, of which the writer has no knowledge, but those mentioned above are the recognized sections. Of the Kurdish tribes, the Barzanis, together with the Shirwan and the Zibaris, are the most savage. They are known throughout Southern Kurdistan as the Diwana or mad people.

It is an established fact that Kurdistan has, in the past, played a great part in the political activities of the country, and to many minds will still play a greater part in the future, as the Shiah sect will forever remain a thorn in the side of the Sunni Government.



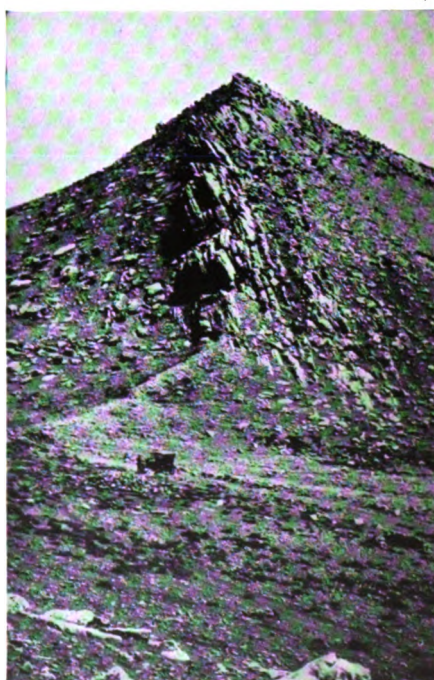
**SHAIKH MAHMOUD—ONE TIME GOVERNOR
OF SULAIMANIYAH, AND NOW A "GUEST"
OF H.M. KING FAISAL.**



**A KURDISH "AGHA."—NOTE THE QUEER
INTERLACINGS OF THE WAISTCOAT.**



**A KURDISH FAMILY OF THE PEASANT
CLASS.**



**TYPICAL KURDISTAN COUNTRY, IN THE
REGION OF DIANA.**

"p.s.a."

By "SEAGULL."

ALTHOUGH many officers are anxious to go to the Staff College and realize some of the advantages to be gained thereby, the entrance examination is generally regarded as being a very difficult one, or at any rate, as too stiff for the average officer to pass.

The Air Ministry have stated in orders that a large percentage of high appointments will, in future, be held by Staff College graduates. It is, therefore, essential that any officer who aims at rising to high rank should try to qualify at that seat of learning. Further, apart from the purely egotistical point of view, any officer who is keen on his job and who has the future of the Royal Air Force at heart, should go to Andover. He will find that his interest in the Service will be vastly increased by the fact that he will gain a wider knowledge of its difficulties, its problems, and its plans for further development.

One of the main advantages of attending a Staff College is that it broadens the mind. There is always a tendency to drift into a rut, it matters not whether we are doctors, masters, soldiers or airmen, and the Staff College course which touches the fringe of such a variety of subjects as History, Political Economy, Geography and International Affairs, will introduce the student to the wide fields of knowledge which still require to be explored by him.

During the whole year the student will be encouraged to read books that are worth while, and be given the time to do this, thus helping him to form a taste for reading books which are of value.

In addition to the professional and educational advantages to be gained from a course at the Staff College, it will be seen from a study of the *Hawk*, the magazine which is published annually by the students, that the year at Andover is by no means all work and no play. For instance, the writer spent six happy weeks during the summer vacation, touring the whole of the United States of America by aeroplane, completing in all, nearly 6,000 miles by air. During the same course, students flew to Turkey, and others visited different European countries. These foreign tours are arranged for students who are assisted both financially and by means of official introductions. From the writer's point of view the trip to the United States was of tremendous value, and opened his eyes to the development in aviation that is being undertaken by our cousins overseas.

It is the writer's opinion that anyone with average intellectual

ability can pass the entrance examination to the Staff College, so that no one should really be discouraged from "having a shot at it." Most officers suffer from an "inferiority complex" with regard to examinations. They believe that only "great brains" can grapple successfully with the deep problems which they see forming part of previous papers. But they should take heart and realize that the majority of students at Andover are necessarily average officers with about the same amount of brains as the rest of humanity. There are very few "geniuses" in this world, and comparatively few rise above their fellows and can be classed as brilliant. Further, although there is certainly room on the staff for the brilliant officer who can think constructively, there is plenty of room for the average, reliable and well-trained Staff Officer.

It is suggested that the qualities required of an average Staff Officer are that he should have had some service experience, and be prepared to continue developing this service experience; that he should be able to marshal his ideas, and be able to express them concisely and quickly, either on paper or by word of mouth; that he should be possessed of sufficient human understanding to be able faithfully and efficiently to interpret the policy of the Higher Command, whilst at the same time not losing touch with the more limited point of view which must prevail in units.

Now, as regards the entrance examination; one thing is certain, and that is that there is only one way of passing it, and that is by hard work. Admittedly, some will have to work harder than others.

There are many good articles written on the subject of how to study for the examination, and it is not the purpose of the present article to give detailed advice on this matter * It is, however, intended to discuss the question from a slightly different point of view. It is seldom realized that most officers by the time they are eligible to sit for the examination have already had experience in several different types of units, such as flying training, army or naval co-operation, fighter or bomber squadrons. Nearly all of them have served in one of the overseas commands, and have had some personal experience of the problems of air control which loom so large in Imperial affairs. They probably have sufficient knowledge of these subjects to provide the necessary data required to answer a considerable proportion of the questions which are likely to be set, and which, after all, are only intended to find out if a candidate possesses a fair proportion of general service knowledge. Further, most officers at this stage of their career, have formed opinions on such questions, as, for instance, "What tactics fighters should adopt when attacking a bomber formation," or "How aircraft can be used to improve Imperial

* See THE ROYAL AIR FORCE QUARTERLY, Vol. I, Nos. 1, 2 and 4.

communications." The service manuals which have to be studied are not really so numerous as is sometimes supposed, so the prospective candidate need not be discouraged by his first glance at the syllabus and by the list of books which he is informed should be read !

One difficulty is that many candidates are not capable of using the knowledge which they already possess nor of assimilating that which they try to acquire during their months of intensive study. It is suggested that seventy-five per cent. of this study should consist of practice in writing and in learning to collect one's thoughts and express them in a clear, logical and readable style.

The following outline of a study programme is given, more with the idea of emphasizing the views stated above, than as a time-table to be followed in detail. The amount of time allotted by candidates to each portion of the programme will vary according to the ability and experience of the individual.

For example, let the period of study be divided into four equal parts, the first part to be devoted to acquiring knowledge by reading books and by studying manuals, and in obtaining the data required to answer the questions set in previous examinations.

During the second quarter the candidate should practice expressing his ideas on paper, and learn to set down his facts clearly. It is a useful exercise, for instance, for him to try and write a short paper on the organization and work of the unit in which he has been serving. Let the reader try this. It is surprising how difficult it seems at first, yet, it will be found that in time the matter is comparatively easy.

The third period should be allotted to answering questions which have appeared in previous question papers. This should be done with the help of reference books, when necessary, and no time limit should at first be imposed, although after a while it is useful to ascertain how much time is actually allowed in the paper for each question.

Finally, the last quarter should be set aside for practice in answering questions in a definite period of time. This is probably one of the most important items in the course of study outlined above if the candidate is to be successful at the examination. Probably more officers fail through not being able to finish their paper than for any other reason.

It may be asked how the candidate can best obtain the knowledge and practice required to raise himself to the desired standard. There are several ways of doing this. He can apply for leave and study at home, or he can seek the help of a crammer, or take a correspondence course.

Then again, and this is probably the best method, he can enlist the help of an officer on the spot who has already passed through Andover, and who should be competent to coach him.

Everyone will agree that it is neither amusing nor easy to study

alone night after night. If, further, it is necessary for the student to wait a week or ten days before the corrected exercises are returned by post, his enthusiasm is still more difficult to maintain. The advantages of having a coach in close proximity are great. Papers can be marked quickly and the benefit of personal advice obtained. The coach will naturally be eager that his pupil should pass the examination, and will not only encourage him and keep him "up to scratch," but will ensure that he gives sufficient attention to the various branches of the subject.

At most R.A.F. stations there is now at least one officer who has had the privilege of spending a year at Andover. Before these officers left the Staff College they were told that they were expected to give assistance to other officers who wished to sit for the entrance examination. It is suggested that up to the present, Staff College graduates have perhaps been rather backward in carrying out this part of their service duties. This is a pity, because graduates would find that if they helped other officers to prepare for the course which they have already passed, they would derive considerable benefit themselves.

There is a tendency for students after they leave the Staff College to feel rather "stale." For several months they have covered a considerable number of sheets of foolscap with their illegible hieroglyphics, and there is a somewhat natural desire at the end of the course to leave all that behind and to return to practical work. Surely these officers might find that the time spent in coaching candidates for the Staff College examination would not be wasted; it would refresh their memories and bring to light the surprising fact that they really had learnt quite a lot during their year at Andover.

In conclusion, the writer would like to give a word of encouragement to any reader who feels that he would like to sit for the Staff College entrance examination, but who is dubious about his ability to pass it. It is this — Most of those who have been successful in the past were convinced that they could not pass, and after the examinations, each one was certain that he had failed. Do not be discouraged! With proper coaching and the necessary amount of work it is possible for the average officer to acquire the magic letters—*p.s.a.*

THE HEAVY FIGHTING AEROPLANE

BY AIR-COMMODORE P. F. M. FELLOWES, D.S.O., R.A.F.

THE valuable discussion on this very important subject, between Air-Commodore J. D. Chamier and Group-Captain W. S. Douglas, seems to have terminated in a very small measure of agreement and somewhat too abruptly, hence my intrusion. My purpose is deliberately provocative.

There exists, undoubtedly, a lack of defined thought on the whole subject of air-fighting, and, therefore, to clear the air and to obtain an understandable basis of discussion, certain debatable propositions will now be stated. Ultimately, it is hoped that the silent wealth of experience gained in the war, which has not yet spoken, will arise and either support or demolish these statements.

1. It is not practicable, under normal conditions, for more than one single-seater aircraft at a time to attack the same aircraft.
2. Under special conditions, such as a steady formation of bombers, it is conceivable that a very well-trained pair of single-seaters might conveniently attack one aircraft simultaneously.
3. Two-seater aircraft, if very well drilled, can attack a steady target, such as an aircraft at one side of a formation, four at a time. One from on top, one at the side, one underneath, with guns mounted on movable mountings, and one from behind with fixed guns. They would all be subjected to comparatively long-range fire from the formation.
4. Two-seater aircraft, if manned by very experienced pilots, can conveniently attack a single or very mobile aircraft, two at a time.
5. A two-seater of equal performance and morale is of a higher offensive, plus defensive, power than a single-seater.
6. Multi-seater aircraft can only conveniently attack steady targets, but they can, of course, conveniently attempt to defend against any number of attacking aircraft.
7. Bombing formations will not break formation when in the presence of important forces of attacking aircraft, unless forced to do so by the most intense anti-aircraft fire or some tremendously drastic form of attack.

8. The proportion of the vital area in an aircraft occupied by the man and the material is such as to justify the use of ammunition primarily designed for the destruction of material, as opposed to human life. In other words, to justify the use of explosive or incendiary bullets.
9. The use of parachutes should increase fighting morale in the next war.
10. The accuracy of modern anti-aircraft fire and the destructive power of modern aerial ammunition will decrease fighting morale in the next war.
11. The average individual's morale, even if unwounded himself, gradually crumples under the intensive strain of severe air-fighting.
12. If the average individual is wounded or if his aircraft is frequently severely damaged in air-fighting, his fighting morale decreases rapidly.
13. If silencers were introduced, morale in action would fall. The noise of the engine acts as a relief to the noise of bursting shells and machine-gun fire.
14. The average man prefers to fight in company.
15. Two-seaters manned by average men will have a higher morale than single-seaters.
16. Multi-seaters will tend to have a higher morale in defence than two-seaters.
17. All aircraft can sustain a very large number of hits from small calibre solid bullets without vital damage being suffered.
18. The offensive morale of an air force falls rapidly if heavy losses are continuously sustained. From this point of view the effect is much the same whether aircraft are shot down on the way in or out, as long as they are shot up or, better still, shot down.
19. An unforeseen method of attack becomes exaggerated by rumour and has an effect out of all proportion to the actual results, *e.g.*, "Flaming Onions" (really two-pounder incendiary shells fired by a "Pom-Pom"). From this point of view freak methods of attack or defence are valuable, *e.g.*, A dummy passenger with a back gun fitted to fire through the tail on a reputed single-seater type, or a trailing bomb dragged through a formation, or a large time-bomb dropped from above on to a formation.
20. The main functions of the fighting aeroplane as such are three in number, *i.e.* (a), to repel bombers, torpedo planes, etc.;

(b), to fight each other; and (c), to shoot down reconnoitring aircraft and spotting aircraft. For (a), they require speed, climb and great power of destruction in attack, but not great manœuvring power. For (b) and (c) they require speed, climb, great manœuvring power, but not great power of destruction in attack.

21. The most certain method of getting a fight is to escort a bomber formation.
22. To escort a bombing formation for any other major purpose than to secure a fight is useless, as, unless the bombing formation waits for the fight to be finished, which it could not normally do, the two formations must inevitably lose each other.
23. The morale of pilots engaged in an offensive is much higher than that of those engaged in defence. As one of our war leaders puts it, "to go singing" (literally singing he means), "into a 'dog-fight' is one of the most exhilarating experiences and in fact, is 'The Sport of Kings.'" This attitude of mind could not prevail in a heavy multi-seater fighter nor in a defensive formation, nor very easily in a heavy single-seater interceptor. It can be assumed on this count that the morale of the offensive fighter lasts longer than that of the bomber, etc.
24. To understand the state of mind of the man in the air, and the motives which govern him, it is essential to recognize the great difference which exists between fighting at sea or on land, and fighting in the air. In the air there are three dimensions, and due to this, and the consequent ease with which the offensive can be almost decently evaded, the man himself becomes a voluntary rather than a disciplined fighter. On the contrary, the man at sea or on land is a disciplined rather than a voluntary fighter. Therefore, in the air it is much more necessary to consider the outlook with which an individual enters a fight and how he estimates his chance of success. The average man, on his own initiative, will only enter and pursue a fight when he considers he has a reasonable chance of success, and he will not willingly follow a foolhardy leader who takes undesirable or unnecessary risks. His offensive spirit will, of course, vary largely with circumstances, in defence of his own home for instance, he would attempt things he would not contemplate over the enemy lines. Proper balance and skilful leadership will get excellent results, but, even so, it must be recognized that fighting types must be evolved to suit fighting tactics which are to be carried out by the average man. To do other than this is to live in a fool's paradise.

25. The cold-blooded and calculating type of fighter pilot was the type which lasted longest and was most successful in the last war. He took no avoidable risks, and was always well above his enemy, and seldom entered a "dog-fight" or was shot about. As a result, he maintained, and even increased, his morale with experience.
26. The dashing type, who, without thought or imagination, rushed straight into the fight at no range and from any position, lasted no time at all. In the next war he will last even a shorter time.
27. Due to the increase in speed of fighting aircraft, unsheltered back guns in the next war will be almost impossible to fight, due to wind pressures. It will, therefore, become necessary to provide shielded guns, and, due to the stresses set up by sudden changes of direction at high speeds, special slings or seats for gun-layers.

The object of stating this series of propositions is to assist the untutored imagination to visualize what is involved, and to disclose the basis on which the discussion, as to the types of fighters, is erected.

Let us take it that there are no objections to the multiplication of types, and see how many we can find a use for. Let us assume that the following types exist:—

The single-seater fighter. The best aircraft to meet it is the same type, lightly loaded, with maximum speed and climb, armed with small calibre machine guns. The most essential feature in the single-seater fighter is firstly, climb, or light loading, together with manoeuvrability, secondarily speed, and thirdly speed in the dive. The reason light-loading is so important is to enable height to be gained on an opponent in a fight. If this can be obtained, the opponent can be shot or driven down and a return to the base made at a selected time. If there is more than one opponent then the position is not so easy, but it is as good as it can be. The morale of the fighting pilot, particularly when over the enemy lines, who can be outclimbed in the turn is necessarily low.

The light single-seater interceptor requires much the same qualities as the single-seater fighter, but speed on the level and in the dive becomes more important, and manoeuvrability less. The best aircraft to meet it is the single-seater fighter.

The light two-seater interceptor, if it were possible to design an aircraft of this type of approximately the same performance as the single-seater, due to the power of a number together delivering concentrated fire, it should prove superior to the single-seater in attack of a formation. The best type to meet it is the light two-seater fighter.

Two-seater fighter. The best aircraft to meet it is the same type, lightly loaded, manoeuvrable with maximum speed and climb, and armed with small calibre machine guns, fixed and movable. In this type, although it should be loaded as lightly as possible, climb is really not much more important than speed. Although two-seaters normally fight with their fixed guns, the height gauge between two-seaters does not possess the same vital importance that it does between single-seaters.

The heavy single-seater interceptor armed with one or more fixed heavy machine guns firing explosive shells. This type is purely defensive. It requires great speed and climb and steadiness in flight and in the dive, but not great manoeuvrability. It would be at the mercy of either the light single-seater or two-seater fighter due to its size, consequent on its load, and inevitable comparative lack of mobility. Its functions would be to find and attack medium heavy and heavy bomber formations.

The heavy two-seater interceptor, either single or twin-engine aircraft, armed with one or more fixed heavy machine guns firing explosive shells, and a light machine gun on a movable mounting for defensive purposes. This type is purely defensive. It requires great speed and climb and steadiness in flight, and on the dive, but not great manoeuvring powers. Its functions would be the same as the heavy single-seater interceptor, and it would equally be at the mercy of the single or two-seater fighter.

The medium heavy and heavy bomber armed with light machine guns in turrets and fitted to take a heavy machine gun firing on a wide arc astern when carrying a decreased bomb load. These aircraft would require maximum lift and a fair speed. The best type to attack these aircraft is the heavy interceptor fighter.

The light bomber armed with light machine guns with fixed and movable mountings. The best type to attack a formation of light bombers is the light two-seater fighter, because several of these craft can conveniently concentrate on one of the formation. If anything heavy and unmanoeuvrable, unescorted, attacked a formation of these craft they would break formation and shoot the attacker down.

The heavy multi-seater and multi-gun fighter, armed with movable automatic or machine guns firing explosive shells for attack, and also armed with light machine guns for defence. This aircraft would require maximum climb and speed. The best aircraft to attack it would be the heavy interceptor.

The reconnaissance and photographic two-seater armed with light machine guns with fixed and movable mountings. This aircraft has to be fast and mobile, and to have a long range. The best aircraft to attack it are either the single or two-seater fighters.

The army co-operation two-seater aircraft armed with light machine guns and with fixed and movable mountings. This aircraft has to be fast, lightly loaded and mobile. The best aircraft to attack it are either the single or two-seater fighters.

The three-seater reconnaissance armed with light machine guns mounted on fixed and movable mountings. This aircraft has to be fast and mobile with a low landing speed. The best aircraft to attack it are either the single or two-seater fighters.

The torpedo bomber single and two-seater aircraft armed with light machine guns mounted on fixed and movable mountings. The best aircraft to attack it is the single or two-seater fighter.

The large boat-seaplane armed with light machine guns and fitted to take a heavy machine gun firing on a wide arc astern on a moveable mounting. The best aircraft to attack it is the heavy interceptor.

It can be said, generally, that types very similar to those, enumerated above, exist at present in the air forces of the world, with the exception of three. They are the heavy single-seater interceptor, the heavy two-seater interceptor and the heavy multi-seater fighter. The first two of these three types have one main purpose, which is to defend home bases against attack by large aircraft, whereas the third has a dual purpose; (i) the defence of home bases against attack by heavy aircraft; and (ii) escort duties with heavy bomber formations.

Let us take the first, the heavy interceptor. What can it do which other existing aircraft cannot do? It can maintain its position astern of a medium heavy or heavy bombing formation at a range at which it would be comparatively immune to light machine-gun fire, and from there keep up a more accurate and effective fire than that to which it is subjected. It can do this by virtue of the fact that the heavy machine guns in the interceptor are fixed whereas those in the bombing formation are movable; and also on two assumptions—the first, that the fire of fixed heavy machine guns would be effectively accurate at ranges at which light or heavy machine-gun fire on movable mountings is inefficient; the second, that these heavy machine guns can be designed to fire a shell which is effective against a heavy bomber structure. There will probably be many who will object to the very idea of lengthening the range for opening fire as destructive of the offensive spirit, but if the problem is attacked in a truly scientific spirit, this objection must disappear.

To achieve this it would be necessary definitely to ascertain that a heavy machine gun, firing shells, can obtain a pattern dangerous to a medium-heavy or heavy bomber at a range at which fire from guns, mounted on movable mountings, would not be really dangerous to the heavy interceptor fighter.

The Germans, in the last war, fired from their machine guns a .300-

time explosive bullet, the purpose of which was to show a spot in the trajectory. This spot was at about 200 metres. If this spot passed through the target, as the fighter dived towards the target, he knew his range was less than 200 metres and also that the proportionate number of his bullets, which were of this type, were exploding on contact with the enemy aircraft. These bullets became very sensitive to impact very soon after the timing composition had been ignited on discharge (they remained insensitive for a short distance in order to render them safe to fire through a propeller). The same type of bullet with a longer range before exploding would perform the same function in the heavy machine gun. Supposing this range is found to be 500 yards, then anywhere within this range the bullets are explosive, and until the interceptor gets within, say, 200 yards of the bomber, it is comparatively safe from reprisal. That is to say, it has a 300-yards line of approach, in which it can do vital damage with comparative immunity. It is assumed that the chances of being brought down by fire from a gun on a movable mounting at over 200 yards are comparatively slight.

Armed thus, the object of the interceptor fighters would be to climb above the bombers and come in fast on to the tail of all those aircraft forming the rear of the formation until at a range of 500 yards, when the rate of approach would be reduced to a speed where the maximum quantity of ammunition could be discharged into the target during a 300-yard reduction of range. The next series of aircraft would then take up the attack, and so on.

The discovery of the range at which to open fire would be a matter of practice combined with spotting shots, and possibly some simple form of range finder. If this process of attack caused the formation to break up, the light fighters accompanying the heavy interceptors could then take up the attack.

The third of these types, the multi-seater fighter, would have a dual purpose. Home defence and escort duties. For home defence it would require three qualities, which, by its very nature, it would be very difficult, if not impossible, simultaneously to achieve in one design. They are, high rate of climb, great speed and accuracy of fire in attack. To combine great speed and a high rate of climb in an aircraft so equipped and as heavily loaded as a multi-seater fighter would have to be, appears impossible. To obtain real accuracy of fire in the air from anything but a fixed mounting, except at very close range, is, as far as is known, impossible. Due to the size of the aircraft, accuracy of fire with a fixed mounting would be very difficult, if not impossible, to achieve. On these grounds alone then, the multi-seater fighter, for purposes of home defence, is unsuitable.

For escort duties it would have a definite use, and if it were

impossible to modify the heavy bomber to achieve the same purpose, by mounting additional guns and lessening the bomb load, there would be a very strong argument for the design of such a type. Probably, the heavy bomber can be so modified, and, in the development in defence tactics for heavy-bomber formations, it may be found that it will always be necessary to devote a certain proportion of the total bomb load of the squadron to the installation of extra defensive armament.

It will, no doubt, be found to be of vital importance to morale to prevent very heavy losses at any stage of the bombing offensive, and this will be particularly important in its early phases. The two most obvious ways of doing this are by sending a fighter escort, perhaps equipped with extra petrol, easily unloaded at will, to assist the bombers to break through the first line of defence, and so, incidentally, secure a fight for themselves; and also to equip and detail certain of the bombers to act mainly as a defence to their heavily-loaded brethren.

Hence, on the assumption that the weapons and ammunition discussed are possible to design, and consequent on the situation in regard to types outlined, it seems that the introduction of a heavy interceptor would fill a real need, but that the multi-seater fighter should be unnecessary if proper steps are taken in other directions.

If, however, the guns and ammunition to arm the heavy interceptor cannot be developed, then the defensive measures rest on the accuracy of fire of the small calibre machine gun, and the best vehicle to carry this gun is unquestionably the type which can most easily reach the attacking formation; this at present appears to be the single-seater. But if a two-seater of approximately equal performance, equipped with shielded mountings which permit of real accuracy of fire, from movable guns, can be designed, there can be little doubt that this two-seater would offer the best chance of an effective offensive defence because of its superior power of concentrating fire. There are, however, obviously two very large "ifs" in this, and the probabilities are that development will be rather in the direction of increasing the number of fixed guns carried by the single-seater interceptor. If this is the line in which development is to take place, then we shall have to accept the probability that attacking formations will get through without actually being broken up.

HOME DEFENCE AND FLEET DEFENCE : SINGLE-SEATER OR TWO-SEATER ?

BY LIEUTENANT E. B. CARNDUFF, R.N.

THE respective merits of single and two-seater fighter aircraft have been discussed at length in Service magazines and the advantages peculiar to each type explained by its protagonist. In a recent article in *THE ROYAL AIR FORCE QUARTERLY*, Squadron-Leader F. W. Walker discussed the subject from the point of view of the Fleet Air Arm, and gave the requirements for fighter aircraft for the defence of the Fleet.

Now, it may be argued that there is no difference between fighting over the land and fighting over the sea, and, tactically, *i.e.*, when defenders and attackers have joined battle, this may be so, but the interception and attack of enemy formations, though fundamentally similar over land and sea, must be modified to suit the particular conditions because they are by no means identical.

"The time factor here," * says Squadron-Leader Walker, "as in Home Defence work, is one of great importance. The enemy must be engaged and either destroyed or turned back before his torpedoes or bombs are launched." This may be achieved, of course, either by patrols of fighters already in the air, directed by W/T, R/T or V/S from the ground or ship, or by extra-high-performance fighters which take off and climb rapidly to the attack on the receipt of information of the enemy's approach.

In the case of a hostile formation approaching London from the south, the enemy will arrive over our coast at a distance of about 150 miles from his objective. Moreover, there is an elaborate organization of sound locators and ground observers in communication with H.Q., A.D.G.B., so that it may be assumed that information of the enemy's approach will be available at least as soon as the aircraft cross the coast.

At sea, however, the Commander-in-Chief cannot rely on information of the approach of enemy aircraft to anything like the same extent as the A.O.C.-in-C., A.D.G.B. He may be warned by W/T by a shadowing reconnaissance aeroplane as soon as the enemy striking force is flown off from the carrier or carriers. He may receive the information from one of his own ships on sighting the formation on its way, but, on the other hand, it is sometimes possible for torpedo aircraft to arrive over the Battle Fleet and be unobserved until they are diving to deliver

* Referring to Fleet Defence.

their attack. It would appear, then, that to rely entirely on what is generally known as the "Interceptor" type of fighter, *i.e.*, the type that is dispatched to the attack when it is known that the enemy is approaching, for the defence of the fleet would be a risky policy.

Nevertheless, it would be difficult if not impossible to maintain a constant patrol of fighters in the air during the daylight hours owing to the limited numbers available. The disposition of fighter aircraft for the defence of the fleet will not be discussed here, but the difficulties to be faced have been mentioned with a view to emphasizing the importance of the time factor in the problem of interception, and particularly at sea.

Many champions of the two-seater fighter advocate a method of attack in which the fighters fly close to the enemy formation in such a position as to be protected from retaliatory fire by the blind spots of the enemy aeroplanes, while the air gunners in the fighters shoot at the bombers. This form of attack may be effective against high-altitude bombers approaching their target, when they must fly on a steady course at a constant height in order to drop their bombs with accuracy, and when, moreover, the occupant of the bomber's rear seat must attend to his bomb sight, but it would be less effective against a formation of torpedo aircraft, who are only desirous of maintaining a rough course in the direction of our Battle Fleet, and to whom alteration of height is of little or no consequence. Incidentally, it is doubtful if a flight of fighters could be so ranged near a bomber formation as to render each and every fighter immune from the fire of every gunner in the bomber formation. If this cannot be achieved, the bombers have just as good a chance of shooting down the fighters as *vice versa*.

In considering the respective merits of single and two-seater fighters, it is remarkable that comparisons are always made between a single-seater with two guns firing ahead, and a two-seater with the same armament for the pilot, with an additional gun for the rear gunner. In so far as the near future is concerned, a comparison between the two-seater described above, and a single-seater with four or even six guns firing ahead would be more interesting. The addition of extra guns and ammunition to the single-seater naturally involves loss of performance, but probably not to such an extent as to reduce it below that of the two-seater described. Moreover, whereas, in attacking, the single-seater pilot brings his entire armament to bear on the enemy simultaneously, the two-seater is incapable of doing so, and the disengaged gun or guns, not to speak of the man who operates them, are so much dead weight.

The miraculous escapes of many airmen during the last war who returned to their aerodromes with their aeroplanes riddled with bullet-

holes are common knowledge. The truth was that few pilots or back gunners were sufficiently good shots to be anything like certain of bringing down an enemy, even in the most favourable circumstances. The most successful air fighter was he who was naturally a good shot and practised the art of air gunnery, until he reached a state of perfection, where, once an enemy was at his mercy, he never allowed him to escape. It would seem, therefore, that if air gunnery could be simplified in any way, the standard of shooting would improve, and more hostile aeroplanes would be accounted for.

Owing to the cone of fire, shooting at an aeroplane with a machine gun at 100 yards may be compared with shooting at a snipe at 40 yards with a shotgun, using No. 6 shot. In both cases the pattern would show that, in spite of correct aiming, it is possible for the quarry to escape injury in a vital part. If, however, six machine guns were correctly aimed at an aeroplane at a range of 100 yards, having been aligned so as to converge at that range, the chances of the aeroplane's survival are negligible. At the same time the pattern would be so dense that the aim would not have to be so accurate as would be necessary to ensure success with only one gun.

The point that needs emphasis is that whether in Home Defence or Fleet Defence, the fighter pilot is allowed very little time to do his work, and as time goes on, even this short allowance will be decreased as the speed of aeroplanes increases. Under these conditions, if he is to be relied upon to bring down the enemy, he must be provided with an armament such that a single burst from his guns will be devastating in its effect.

We can use the man in the back seat somewhere else.

"L'INCONNU"

By "RO."

(Notes from an Adjutant's Note Book.)

L'INCONNU! It's an apt description of him and every circumstance concerning him until—

Ah! that little *until*. That slippery unheeded contingency which fate sometimes casts in front of us, to bring us down with *such* a shock to our pet adjustments.

He seemed to have dropped from the skies to the Aerodrome at Northolt in the spring of 1917. I was there as A/Adjutant of 35 (T) Squadron, Major R. Chadwicks.

Ours was the only unit on the station to detail an O.P. when air-raids were due on London.

Keevil, an observer—one of our pupils for higher training—was killed in a "Bristol Fighter" over Regent's Park, when with the first "patrol" we ever sent up. Cole-Hamilton, the "pilot," was specially promoted for his dash on the same occasion. Poor "Cole," as we called him, crashed fatally at Hounslow a few months later.

I refer to these matters because I believe that the squadron's participation in the defence of London touched the reason for "L'Inconnu's" visit.

The Squadron Commander had gone to see Lieutenant-Colonel Loraine, the Wing Commander. I was alone in the office.

How the man won admission to the aerodrome *at all*, much less to my presence, I never heard. Perhaps the solemnity of his appearance helped him.

He was a big person of athletic build and majestic mien; he might have been Marcus Aurelius—beardless! I've never seen Marcus Aurelius, *bien entendu*, so I cannot swear to the likeness. Anyway, I could swear that the suns of many climes had browned my visitor's face, and the friendly glass, I fear, had toned it rosy.

To Downing Street itself his apparel should have ensured admission. For he wore a cape, and a hat that might have graced a cabinet minister. And his footgear had possibilities as fuselages for a brace of S.E. 5's.

He entered the office and laid his hat upon the table as though he were master of the universe.

"Good-day to you," he said, in tones of Hibernian origin, as he held out his sahara of a palm, while the strange glitter in his eye pleased and yet repelled; "'tis proud I am to shake the hand of any man associated with the gallant 'Flying Corps.' The Corps d'Elite of the Allied Forces, and let *no* man contradict me."

The truth of his statement apart, I wouldn't have "*conthradicated*" him for promotion untold. But I looked at the pile of log books awaiting me, and told him I was busy.

Settling himself on the only vacant chair, he proceeded :—

" Faith ! it's busy I've been meself these years past. And it's busier we'll all be before we finish.

" I'd have you understand, sir, I'm no stranger to the air ; nor are its perils unknown to me person.

" Why ! wasn't I mechanic to one of the first of aviators ? Yes ! and I've flown over the waste spaces of the globe.

" Three times have I crashed, but, blessed be God ! it was into a tobacco shop I crashed the last time, reminding me that my cigarette case was empty.

" And now with your permission I'll light me a smoke, for there's no time like the present and I've a deal to say to you."

Without waiting for any leave he lighted a cigarette and emitted two smoke-rings from his mouth. While his next proceeding stopped for the moment my desire to get rid of him.

With alarming gravity he unlocked a small case, and drew forth a file of documents.

" Sir ! " he said, " the Press in times of peace may be an organ of universal compass, unfortunately not always attuned to the behests of the hour. So in these days of national trepidation its function must be made circumspect. For when all's said and done, you know, a wink's as good as a nod to a blind ass, and we are now suffering the calamitous consequences of unbridled editorial pens." Having delivered this oration he looked at me.

I felt inclined to shout, " Hear, hear," but refrained, venturing to point out, instead, that I had no authority to discuss with him *any* matter. He was not to be put off, not he.

" I'm here on no petty business, he continued, as he waved his papers ; " 'tis not tales of paltry people I bring ye, but much less vain boasts for the defeat of the foe.

" No ! my work, sir, is for humanity ; for our great throbbing empire whose fortune now lies in the air of Heaven. Let's begin there, and the next will be easy, for isn't your squadron the only one here taking a part in the defence of London ? "

You've *done* it now, my boy, thought I. So in the pause that ensued I seized the opening to say that whatever his business might be, it was outside mine, and that I must refer him to other authority. At the same time I opened the door and told one of the clerks to escort my visitor to the station-adjutant.

" L'Inconnu " looked at me for a moment, shoved his papers into their case, picked up his hat, and observing that he was " thankful to me indeed," departed.

The station offices were near the entrance to the aerodrome; while our squadron sheds were last, near the boundary. So I rang up the adjutant and said I had sent to him a man, who was either a lunatic or a knave. One who seemed to be, indirectly, seeking information of the London defences. Then I turned to my work.

A quarter-of-an-hour later the clerk returned. He reported that as they neared the offices, his charge looked at his watch, and declared he must be off, otherwise he'd miss his train and an important engagement in town. Nothing would detain him, so the clerk let him go, and informed the station orderly room of what had occurred.

So "L'Inconnu" vanished as strangely as he had come.

As R.O. I joined 84 squadron in France. In December, 1917, we were added to the 22nd Wing 5th Brigade. Ultimately the wing was so augmented, the "service" of a second adjutant were called for. I was detailed for that duty, and posted to Wing H.Q. some time in February, 1918. It was with sincere regret I left 84 Squadron, and its very capable commander, Sholto Douglas.

After "the troubles" of March, 1918, in the months immediately following we were at Bertangles, near Amiens.

I ran the mess then, and went to Abbeville one day to buy stores. When I had transacted my business I called at the officers' club to pick up one of our staff coming off leave. As I went up the steps, an officer, wearing Australian badges, came out, looked at me, hesitated and re-entered the club. In his back and the set of his head I recognized someone I'd seen elsewhere, but for the moment could not place.

I collected my passenger and returned to Bertangles.

It happened that wing billets were near a "Corps" H.Q.

An afternoon very shortly following my visit to Abbeville I was leaving the mess for duty. As I turned into the street a car drew up at the "Corps."

In the car were a prisoner and escort. My way led past the party, which was forming up as I came towards it. About the prisoner there seemed something familiar to me.

When I was within a few feet of them the party turned facing me. Then I had a good look at my man.

He looked me straight in the face. In the world there were no such pair of eyes as his that pleased, and yet repelled.

In a flash I remembered. Turning to an officer nearby I said: "I've seen your prisoner in England."

"Yes!" replied the officer, "we know all about him. He's not an Australian, thank God!"

The prisoner was the officer I'd seen on the club steps at Abbeville. "L'Inconnu," of Northolt, and a spy.

WHEN GREEK MET GREEK BESIDE TIGRIS

BY JANE PURVES.

It was early evening after a very hot day, and we had walked a good way south of Baghdad along the bund to breathe some fresher air.

It was very lovely in that quiet peace. A north-going flight of hundreds of rooks passed overhead in the green and soft purple of approaching nightfall. A dull rose haze that hid the city was pierced by its many minarets that now twinkled above the floating dust from a heavy day's traffic with those fairy-like illuminations of each Thursday's sunset.

Tigris swirled peacefully down, its oily surface reflecting the last of the afterglow; here and there a black silhouette of a man fishing from a small gûfa broke into all that colour with a strong note of contrast. The river was at a low summer level, and the scores of dhows lying at the water's edge trailed many fathoms of thick rope cables ashore to the inevitable chunks of stone that were used as anchors.

The dhows waited hopeful of to-morrow's—next week's—possible cargoes, but meantime the day's work was done for all but cooks and café-keepers, and groups of idle Arabs squatted about the decks. An earthen oven glowed red on each deck, sending a thin trail of smoke straight upwards in that still air as cooks were busy making the day's fresh khubz. Most of the men lay about content to do nothing, but some few had gone ashore, and rounding a bend of the river we came suddenly upon a group of them gathered in some considerable excitement about a man squatting before a low Arab table on the bund.

He was a ragged Persian seated on a ragged filthy rug and had the dull opaque eyes of an old sufferer from trachoma, but his long slim fingers, that might have belonged to a violinist or surgeon were now manipulating three cards on the table before him while he kept up a broken Arabic invitation to all present to "find the lady."

It made one homesick in a flash for Epsom Downs!

There is a bit of a gambler in all Arabs, and he soon found a client. Cheered on by the laughter of the onlookers, an Arab, who had been studying the game long enough to be quite sure that he knew all about it, threw a silver rupee on a card.

He chose wrong, of course, and instantly pounced on the other two, thinking the queen had been missing all the time, and looked quite nonplussed when she turned up.

He tossed two more rupees on the cards before he had a win, when, at the thought that his luck was now in, he threw in rupees and half-rupees as quickly as the cards were turned until his cash was exhausted.

Then in sudden anger he drew out a huge silver watch and chain, and put them one by one upon his chosen cards amidst the excited comments of the crowd.

Alas, they too were swept into the happy Persian's wallet.

The Arab stood frowning deeply and staring hard at the Persian's face as he continued his toneless patter.

Whether it was the apparent stupidity of the man's features, or the dull blinded look of his eyes, or no, something stirred the Arab to a swift determination and, amidst the loud chuckles of the now surging crowd, he stripped off his robe and handed it to the Persian, literally "staking his shirt," his waistcoat, his full trousers, and his embroidered belt upon his fancy.

While the Persian was handling the latter the Arab, now clad only in his cotton drawers and turban, bent swiftly, picked up the queen as if to make sure she really was upon the table, and knicked a tiny bit off one corner.

The Persian resumed his light-fingered manipulation once more, but now the Arab began to get his own back.

Little by little he won his wardrobe back, to the utter bewilderment of the Persian who saw his livelihood vanishing. Had the Arab been wise enough to lose now and then he might have been many rupees in hand at the end of the duel. Three wins in succession made the Persian call a halt, for he smelt a rat, and he fingered each card all over before the next deal.

A slow smile spread over his sightless face, and he almost winked a blinded eye as he swept the cards off the board, and produced a fresh pack. To the jeers and laughter of the hilarious crowd swarming around him, the Arab had to save his face by betting again on his intuition, and gradually began to lose once more as we turned homewards.

UNREST IN WHITEHALL ; OR, CORNWALL CALLING

From Whitehall in the month of June
Release me, please, and do it soon.
For who may hope to pen a minute
Without some touch of rancour in it
When, far from swivel-chairs and files,
The wavelets dance and summer smiles?
Here in the departmental gloom
No linnet sings, no roses bloom,
And golden lads and typists must,
As office cleaners, come to dust.
My head, this afternoon, is bad.
The Devil seize my blotting-pad !

* * *

In Cornwall now, I'd have you know,
The trumpets of the foxgloves blow
And all the banks are shining blue
With flowers whose names I never knew.
On Cornish hills the air's like wine,
And I adore the Cornish kine
Whose cream is churned in country dairies
By maids who know the haunts of fairies,
But not of Under-Secretaries.

To-night, to-night is Bodmin Fair !
The odorous cressets hiss and flare,
The brazen-throated showmen bawl,
And mirth surrounds the hoop-la stall.
On such a night, in times of yore,
With rashness which one may deplore,
I plunged into the garish feast
And rode upon a carven beast ;
Then, deep amid the sawdust—tut !—
Brought down a hairy coconut !

Away, away ! escape with me
Upon the wings of Poesy
To yellow sands where men may sport
More freely than in Whitehall Court.
Already with thee, as the dawn
Invites us forth to hunt the prawn,
Or seaward skim the bevelled stone—
But pardon me—my telephone.

* * *

Oh ! who can hope to write a minute
Without some note of fury in it
When white sails gleam and summer smiles,
But not on these repulsive files ?
From Whitehall in the month of June
Remove me, please, *and do it soon*.

C. L. M.

THE JUNGLE COOLIE

HAVE you ever camped in jungle when the early rains have fallen,
And no sound is heard, save steady drip, drip, drip?
When there's not a soul to talk to,
Not a single man to talk to,
And the " murgi " diet gives your soul the pip?
Then listen to your coolies,
To your optimistic coolies,
As they lift their loads of fifty pounds and sing :

Chorus.

Jog, jog, jog,
With our load slung on our shoulders
We trot through wildest jungle
With its " *geddas* " and its boulders.
We will march the whole day long,
Always joyful, full of song,
For there's toddy waiting when the journey's done.

Did you never sit in summer, with the awful heat increasing,
Doing work without a punkah, ice or fan?
With the jungle all a-humming,
The mosquitoes all a-humming,
When your language had but one word in it—" *damn* " ?
Then listen to your coolies,
To your naked, earth-brown coolies,
As they lift their loads of fifty pounds and sing :

Chorus.

Jog, jog, jog,
With our load slung on our shoulders
We trot through wildest jungle
With its " *geddas* " and its boulders.
We will march the whole day long,
Always joyful, full of song,
For there's toddy waiting when the journey's done.

Take a lesson from the coolie as he lives his life of wonder,
 With his scanty rag and very long cheroot.
 If the toddy be but heady,
 Be it "kavadi" or "jeddi,"
 He will carry all—your thermos flask to boot.
 For whatever be the weather,
 Be it wet or burning weather,
 He lifts up the load he's given, while he sings :

Chorus.

Jog, jog, jog,
 With our load slung on our shoulders
 We trot through wildest jungle
 With its "geddas" and its boulders.
 We will march the whole day long,
 Always joyful, full of song,
 For there's toddy waiting when the journey's done.

A. R.

Vizagapatam, 1911.

EASTERN LOVE

I HAVE dwelt in the East,
 And the call of it
 Echoes a call of love.
 My heart lies there in the soul of it
 Where I sweated, and loved, and strove.
 I have lived with those that dared with me;
 I have joyed with those that lived with me
 Mid golden sand and rock.

'Tis these I have loved : the dung fires,
 Pungent, acrid, and raw.
 The sweep of the hawks in the morning
 As tireless as they soar.
 The moon on the Pyramids gleaming—
 The lust beneath unknown.
 The Khamsin streaming, screaming
 Around my shelter of stone.

The grunt of the camel as slowly
 He barracks with his load.
 The dancing, mocking mirage
 Along the desert road.
 The moonbeams in the palm trees,
 The shelter of a tent;
 The soothing of the calm seas
 Where dream-thoughts came and went.

Muezzin at the dawning
 When men are called to prayer.
 The chanting in the morning
 Of those who sell their ware.
 The cooing of a pigeon
 Beside a desert well.
 The winging of a widgeon;
 The haunts of the gazelle.

The saggia slowly creaking
 Beside the winding Nile;
 The opal sunlight breaking
 On Philæ's mystic isle.
 These have I loved, and ever
 I hear their beckoning call
 With joy that naught can sever;
 That Death cannot recall.

Yet comes the time for parting
 When life leads into death,
 And all of life—
 Its hate and strife—
 Will end through the traitor—Breath.
 But with me I take the mem'ry
 Somewhere—below, above—
 And leave a gift
 For those who drift,
 Of praise and lasting Love.

A. R.

Egypt, 1932.

AT THE PYRAMIDS

Do these rise out of a dead land
On which a fading star shines
And the Khamsin whines
Over a dread land?

Here we go round the Pyramids,
The Pyramids, the Pyramids.
Here we go round the Pyramids
At two o'clock in the morning.

Supine upon sand of gold
Stands the Great Pyramid, grey and cold;
Ghost from the Dream-Kingdom
Of the White Lotus
Infinitely old.

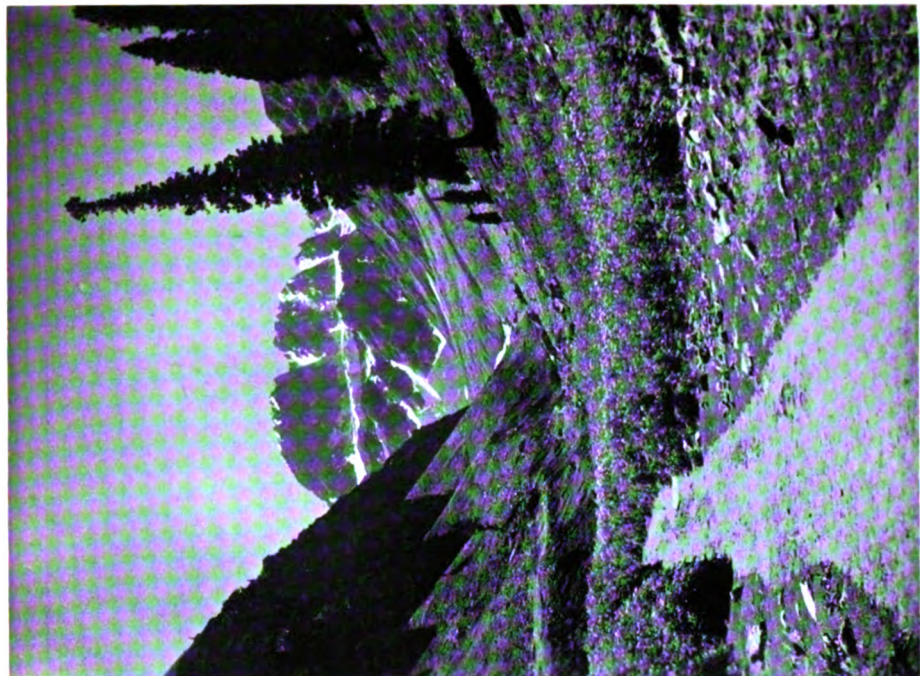
Round and round the Pyramids,
The Pyramids, the Pyramids.
Round and round the Pyramids
To Mena House at even.

Still as the depths of the eternal sea
Glitters the gleaming gold
Of endless sand,
And mystery-wrapt stands
HE—
Stone-carved and still—
The Sphinx,
Silent and grand.

There they go round the Pyramids,
The Pyramids, the Pyramids.
There they go round the Pyramids
The tourist and the donkey.

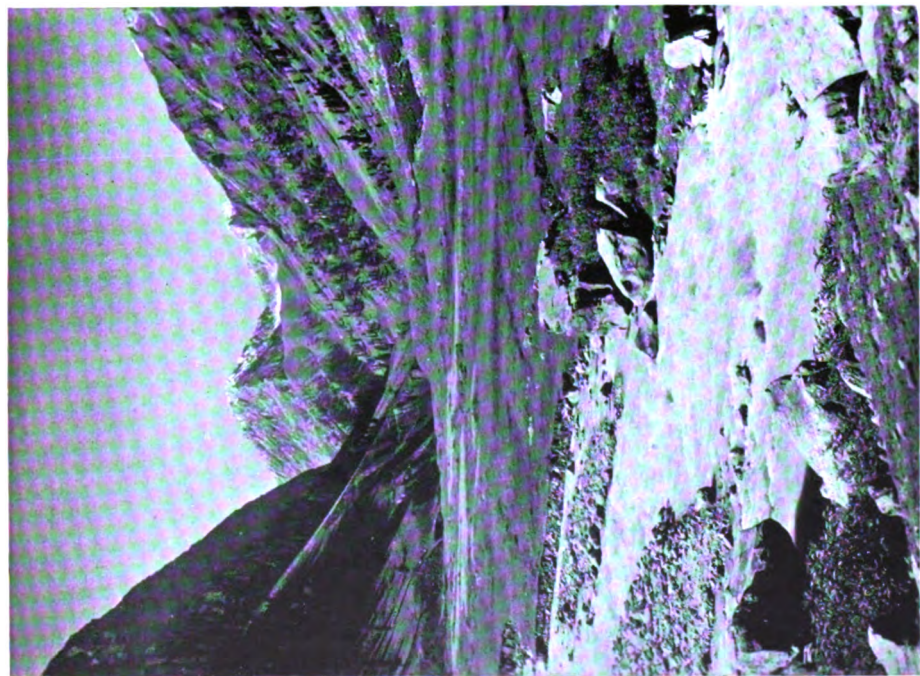
A. R.

Mena, 1930.



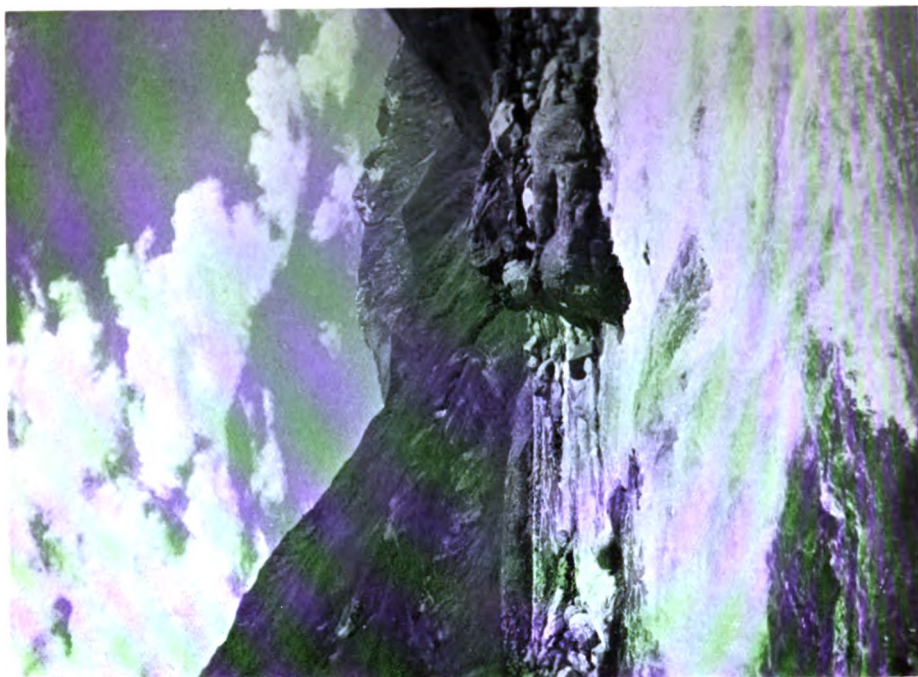
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THE GLACIER NEAR BATTA KUNDI.



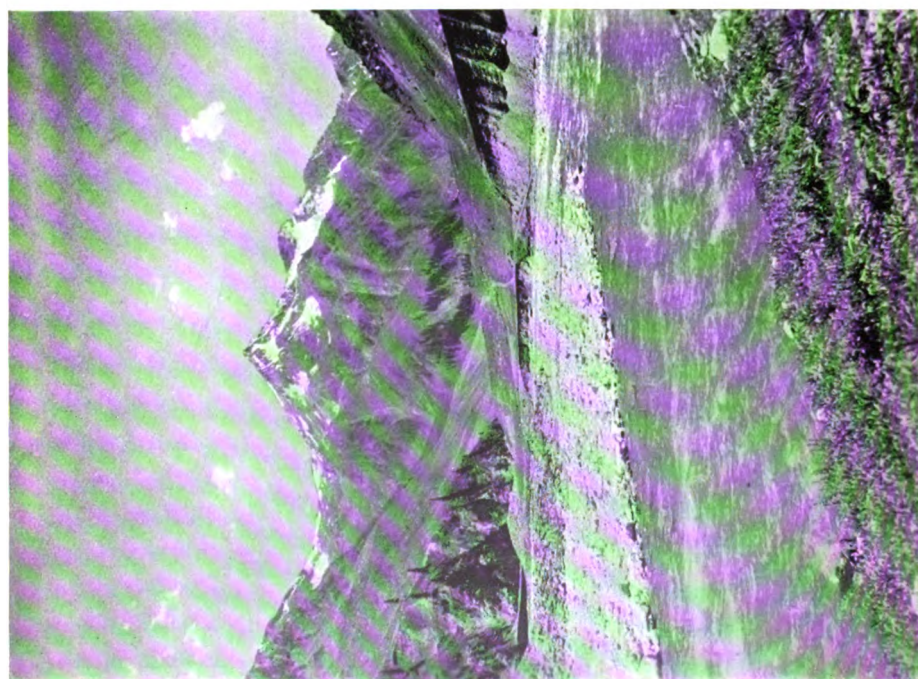
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THE "MARG" AT BATTA KUNDI.



[Copyright reserved.]

THE UPPER REACHES OF THE RIVER.



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THE KACHAN MATTERHORN.

AN INEXPENSIVE HOLIDAY IN INDIA

By KALAGHAR.

It has often been said that love is blind—the truth of which statement I am not prepared to question—but it seems to me that convention is blinder still.

The average Englishman serving on the North-West Frontier of India—and the Air Force officer is no exception—believes that “Kashmir” and “leave” are almost synonymous, and if he listens to convention he will learn further that in Kashmir only is it possible to trek through beautiful mountain scenery. In short, leave, by the dictates of convention, must be spent in Kashmir, no matter how much it costs to go there. It is left to the impecunious flying officer—married and off the strength—to throw aside the “blinkers” with which convention has blinded him, and find, almost at his very doorstep, those things which conventionally exist only in Kashmir. I do not wish to infer that everything Kashmir has to offer can be found at lesser cost elsewhere, for that would not be true; it is my object to show where it is possible to trek in scenery as superb as that of Kashmir, at a cost so small as to be within the means of any junior officer.

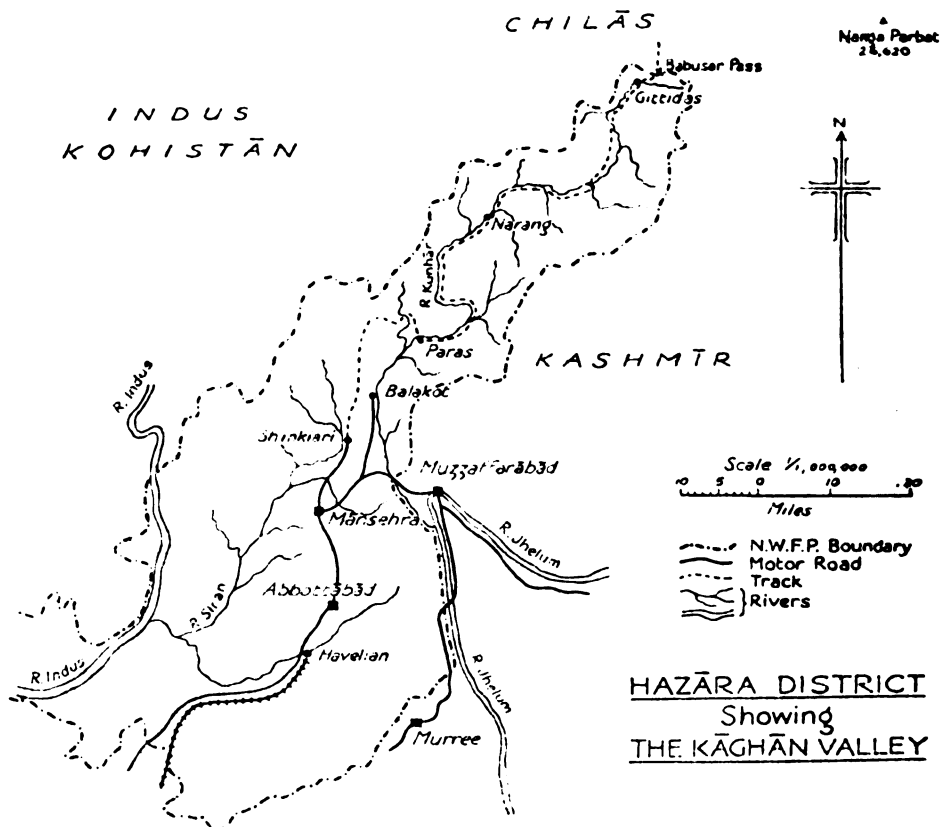
The most easterly portion of the North-West Frontier Province is the Hazara District, shaped like a man's thumb, in the base of which lies Abbottabad the administrative centre. The “thumb” itself stretches North-East between Indus Kohistan and Kashmir to Chilas Agency. It consists of the Valley of the Kunhar River, which, rising in the great Himalaya Range, flows through beautiful mountain scenery to join the Jhelum a few miles south of Muzzafarabad. This valley is more commonly known as the Kaghan, and it is here that a delightful leave can be spent.

The trek starts from Balakot, which is easily accessible by car, though the last few miles are over a narrow *kachcha* road. From there the journey is made on foot or on ponies, while mules carry the stores, tents, etc.

The valley is divided into eight stages, the lengths of which vary from eight to fourteen miles. M.E.S. rest houses mark these stages. These rest houses consist of two bedrooms (with two beds in each), and a kitchen, and each stands in a compound in which tents can be pitched if necessary. No charge is made for occupying the rooms beyond the usual *bakhshish* to the *Chaukidar*. The last two stages

are marked by police posts only, in the vicinity of which there are good pitches for tents.

The rest house at Balakot is about 3,500 feet above sea-level, and Gittidas, ninety miles away, is roughly 13,000 feet. From this it will be seen that the scenery varies from the crops of the foothills to snow and flowers above the tree line. This insures unbounded



pleasure throughout the trek, while the presence of the river everywhere enhances the beauty of the scene. For the botanist there is almost unlimited scope, the upper reaches of the valley being a veritable carpet of flowers, while, for the photographer, the whole trek is a source of never-ending material from which to make beautiful pictures. The Kāghān Valley is also renowned amongst entomologists for the beauty and variety of its butterflies and moths. For those who have no such hobbies the exhilarating walks through this ever-changing scenery make of the trek a healthy and pleasant holiday "far from the madding crowd." The river and lakes are being stocked with trout so that in a few years there should be good fishing. Personally,



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WHERE WE FISHED FOR SNOW-TROUT AT NARANG.



[Copyright reserved.]

NEAR THE TOP OF THE TREE-LINE.

though no angler, I found a great deal of pleasure in fishing for snow-trout at Narang. These fish, though "trash," are quite good eating.

The climax of the trek is reached after a further half-stage beyond Gittidas to the top of the Babusar Pass. From here, Nanga Parbat (26,620 feet), the highest mountain in North-West India, is only about forty miles away, so that on a clear day a fine view of her may be obtained. As the sun rises almost directly behind her (and it is only at dawn that she is likely to be visible) Nanga is a difficult subject for the photographer, but, even if she herself is completely obscured by cloud, the magnificent views in all directions are full compensation for an early start and a stiff climb. A better view of Nanga Parbat can be obtained, I am told, by going a day's trek up a side valley near Gittidas, and climbing the intervening mountain. There are many such treks up side valleys which can be made if time permits.

The return journey can be varied by crossing the river at Paras and climbing up into the forestry country. Here the stages are between seven and sixteen miles long, and are marked by forest rest houses. These are more comfortable than those of the M.E.S., and are very picturesque in their idyllic surroundings. The charge for these bungalows is Rs.1/8/- per head per night. The trekker will be well repayed for the very stiff climb up from Paras, by the peculiar beauties of the forest walks. This trek leads into the next valley, finishing at Shinkiari, from where a good road runs into Abbottabad.

The cost of the whole trek should not exceed Rs.200/- per head per month, excluding the return railway journey to Havelian (which is railhead), and any special equipment, such as photographic materials. This ought to cover the cost of transport, stores, servant's wages, *bakhshish* to coolies, *Chaukidars*, etc., and supplies bought *en route*. The cost of the railway journey is approximately Rs.10/- per head first-class from Peshawar. Information concerning the hire of transport may be obtained from the District Commissioner, Hazara, who issues a booklet on the subject. Full details of the valley trek, and passes for the use of rest houses, may be obtained from the Garrison Engineer, Hazara, while application should be made to the Conservator of Forests, North-West Frontier Province for permission to trek his territory. All these have their offices in Abbottabad.

Anyone trekking the Kaghan Valley is advised to take sufficient stores (including tinned milk and butter) for the whole trek. Eggs, vegetables, milk, meat, etc., are obtainable, but cannot be relied upon.

An officer stationed in the North-West Frontier Province will find it well worth while to investigate the possibilities of this trek. If he decides to visit the Kaghan he is sure to spend a very pleasant leave in a way peculiarly suited to the finances of any officer in these times of increased Income Tax and cuts in pay.

TEMBO! TEMBO!!

An Elephant Story

BY GROUP-CAPTAIN A. A. WALSER, M.C., D.F.C., *p.s.a.*

THERE is a curious force that seems to draw one pair of eyes to another across space. What this force is and why it should manifest itself on some occasions and not on others is not easy to understand. A common experience which has happened to most of us in a theatre is to look at someone seated at a distance, observe him stir uneasily and then turn round and look straight at you as if his eyes were being drawn by an invisible magnet.

Animals, as every big-game hunter knows, are affected in a similar manner, and very soon become conscious of being watched, even when the observer is concealed from their view. I will now try to relate an incident which once occurred to me, which tends to show that animals themselves can exercise that strange, uncanny power even on human beings.

A year or two ago, while serving on the North-West Frontier of India, I thought I would like to go to East Africa for a holiday, and having been granted three months' leave after a slight *fracas* with the Muhsuds in Waziristan, I started off on my big-game shooting adventure.

My expedition started disastrously. The professional white hunter, a first-rate fellow, who had made all the arrangements for the expedition, died of blackwater fever some days after we had started, and I was forced to continue alone. This calamity, besides robbing me of a friend, left me in an unpleasant position. I had taken out a full licence and a licence for two elephants; but although I had shot big game in other parts of the world, I had no great experience of African conditions, and the only elephant I had killed had been in another part of Africa where conditions were very different. I could not afford to "take on" another professional hunter, but by good fortune I met a young planter while I was trekking towards the north-west, who appeared to be at a loose end, and readily agreed to accompany me. He had no experience of big game hunting, but his knowledge of Swahili was invaluable in making the "boys" understand what was required of them.

Day after day we trekked in the direction of the Abyssinian border, passing through an arid, scrub-covered country under a burning sun. The rhinoceros, the giraffe and the zebra appeared to be the only visible inhabitants, and, coming as I did from India, where even the

rugged frontier districts are cultivated wherever it is possible to scrape together a few feet of soil, it seemed strange to pass through a land where there was no sign of human life.

At last, after many days, we came across the tracks of an elephant, which led to a dried-up water-course. This dry river-bed was evidently visited regularly by elephants in search of water. It was really a sandy nullah about two hundred yards wide, with banks about five feet high on either side. Although the river-bed itself was quite dry, there was water a very short distance below the surface, so that by digging down a foot or two one could form a small pool.

We were delighted. There were traces of elephant everywhere—holes which they had scooped out in the sand, trees and bushes that they had torn up, and huge dumps of elephant dung which my trackers studied with the greatest care, and from which they pretended to tell the day—and even the hour—at which the herd has passed. The country here was a wilderness of rock and sand, studded here and there with thorn-trees, mimosa bushes and acacias. In places, where the water was fairly close to the surface, the trees and scrub were so thick on the banks of the nullah as to be almost impenetrable.

Occasionally, our progress was checked by the approach of a rhinoceros. These unpleasant brutes are a constant source of annoyance to big game hunters, and cause a great deal of unnecessary bother. They are, as far as I know, the only wild animals that will charge a human being on scent and without provocation. The rhino being short-sighted but gifted with a very keen sense of smell no doubt considers that he cannot afford to give his potential enemy, man, any chances. Consequently, he charges without warning, which is a serious matter in a country where one's view is often limited to a few yards by the scrub. Even if the rhino's charge has no more serious results, it invariably disperses the porters, who hurl their loads to the ground and disappear if possible up the nearest available tree.

We decided to camp by the river-bed, on the chance that the elephants would return at night, and having fixed on the best site, we dragged a few thorn bushes together on the top of the bank where there was a suitable open space, and took up our position inside the "boma." There were four of us: the planter, myself, and two Askaris (native soldiers from the King's African Rifles, who had very kindly been attached to me by the O.C. troops when I passed through Meru).

We had had a long, tiring day, so we decided to take watches in turn. About nine o'clock I was asleep, when my rest was rudely broken by one of the Askaris, who touched me and murmured in a hoarse undertone, "Tembo! Tembo!! Bwana!!!" ("Elephants, master!").

It was a wonderful sight ! By the light of a rising moon I saw a procession of dark shapes moving slowly and silently across the nullah. There were about thirty of them, and they were of all sizes. The herd seemed to be composed chiefly of cows with their calves, the latter varying in size from that of a very small Shetland pony to young bulls, which appeared to be about the size of the elephants one usually sees at the Zoo. There were also a few full-grown bulls, but these seemed to take very little interest in the rest of the herd, and wandered off by themselves. We soon came to the conclusion that none of the bulls that we could see had really sizeable tusks, but we settled down to watch the herd, and found their antics most entertaining.

The herd appeared to advance in properly organized manner, and as soon as they descended into the river-bed, one old cow detached herself from the rest and took station about four hundred yards on the down-wind side of the herd. From this position she never moved, as far as I could see, as long as the elephants remained in the neighbourhood. Two young bulls, apparently driven to it by the remainder of the party, now separated from the herd and went to take station about two hundred yards up-wind. They did not seem to relish their task, since every now and then they would edge away towards some pool in a rather self-conscious manner and attempt to snatch a drink, only to be driven back with prods, amidst much infuriated screaming and trumpeting.

The rest of the herd now settled down to have a good time. They pawed up the sand or dug with their tusks, eventually excavating holes of considerable size, which soon filled with water. The noise they made about it all was quite remarkable. They shrieked and trumpeted and emitted noises which varied from the sound made by a siren to that of an underground train faintly heard rumbling through a tunnel. They sucked in huge quantities of water through their trunks, and blew it all over themselves or over their calves. They drank, and they wallowed, and they snorted.

But suddenly something occurred which unsettled them. A rhinoceros appeared, and, although much the smaller animal, proceeded to drink from the best pool. He seemed in no way overawed by his larger brethren ; in fact, his whole attitude was one of undisguised contempt. The intruder, however, must in some way have become aware of our presence, for he suddenly changed his demeanour. No longer bored and nonchalant, he seemed to become quite demented. He snorted violently, and then charged up and down the nullah like a huge Gadarene swine. After doing this twice he disappeared.

This incident, though it had no immediate effect, seemed to sow unrest amongst the elephants. They began moving about rather

uneasily, and one old cow wandered off by herself, as if searching for something. We watched her move up the nullah and then climb ponderously up the bank. Here she stood for a moment as if hesitating, then turned round, and to our horror, came slowly towards us along the top of the bank.

This was a nice predicament ! It is no easy thing to be certain of killing an elephant with one shot even in broad daylight ; at night, especially when the animal is coming towards you, it is well-nigh impossible. A minor consideration which, however, at the moment did not weigh very heavily, was that there was a fine of £50 for killing a cow elephant, and this also entailed the loss of one's licence !

I crouched, ready to fire, with my .500 d.b. rifle, hoping that something might stop the elephant or cause her to turn back ; but no such luck ! On came the gigantic black shape, slowly, but surely. Every now and then she would raise her trunk and swing it from side to side. Sometimes she would pretend to eat, breaking off a bough, or twisting her trunk round a tuft of grass and carrying it to her mouth. Once she even turned half-round as if to retrace her steps. It was obvious that the animal was suspicious of something — probably without having seen, heard or scented us. All big game hunters know that animals sometimes seem to be warned by a presentiment of danger which cannot easily be explained.

At last the elephant arrived to within a few yards of where I knelt. I could see the glitter from her small, black eyes, and the rumbling in her stomach sounded as if it came from directly above my head. As I knelt there, wondering what I was going to do next, I could not help feeling that my companions must be aware of the danger and must be waiting for my next move with some anxiety. What was I to do ? I had just made up my mind that if she took one more step forward I would fire both barrels into the top of her fore-leg, which I could just distinguish looming in front of me, and then run (N.B.—An elephant cannot move on three legs), when a strange thing happened.

I had not dared, up to this moment, to look round at my companions ; in fact, I had kept so still that I could feel my whole body shaking with the tension. I now suddenly felt impelled to look behind me. I did so, and I looked straight into the eyes of another elephant above and behind me, and not more than eight yards away ! In much less time than it takes to relate, I realized that there were seven or eight elephants on the bank surrounding our flimsy thorn-bush "boma." Silently they had moved up, intent upon discovering what there was in that circle of bushes that made them feel so restless.

I shall never forget the sensations of that moment ! I had a momentary feeling of absolute impotence, and the thought flashed across my mind that the only way out of the difficulty would be to

turn myself into a rat and pop underground. But something had to be done, and done quickly. Any moment, I feared, one of my companions might loose off his rifle. This would, in my opinion, have been quite useless, as some of the elephants would probably have charged forward and trampled us underfoot because the sound of the rifle is evidence of the presence of man—the wild elephant's only real foe.

On the instant, and without knowing the why or wherefore, I switched on the electric torch that was clamped to my rifle, and swung it rapidly in a circle round my head. The effect was magical. Without a sound—almost like ghosts—the elephants turned, scrambled down the banks of the nullah, and made off.

Had I not been suffering from the reaction, I should have been a more interested witness of the silent manner in which these huge quadrupeds moved. They trotted — or rather, ambled — off with a clumsy, rolling gait, moving swiftly and silently over the broken ground. In a few seconds the last of the elephants had disappeared, and I could at last look round at my companions.

The effect on their faces can best be compared with the appearance of plants which have been watered after a long drought. I could see that the strain had been felt even by the Askaris, whose faces looked strangely grey as they squatted, chattering away to each other in awe-stricken undertones.

I looked at my watch. It was nearly four o'clock, and already the spidery thorn-bushes were outlined like lace-work against the grey dawn sky.

We shook ourselves free of ticks and went off thankful to our breakfast some miles away, feeling that, although we had returned empty-handed, we had at any rate not provided sport for a family of elephants.

HALF-YEARLY REVIEW OF SPORT

FROM THE SECRETARY, R.A.F. SPORTS BOARD.

INTRODUCTORY.—In giving this review of the activities of the various Royal Air Force Sports Associations since October last, it is hoped that it will not only be of interest to those who have enjoyed the many hours of friendly rivalry, but will encourage all ranks still further to realize the value of efficiently organized sports and games.

Taking all things into consideration—and by this I mean accidents, injuries, and the exigencies of the Service—the same high standard has been maintained. The Royal Air Force Fencing Union, in particular, are deserving of congratulations on their very good record, which has been achieved largely as the result of the many years of devoted work of its Secretary, Squadron-Leader F. G. Sherriff, who has himself won the highest honours in this sport.

On behalf of the Royal Air Force Sports Board, I should like to take this opportunity of thanking again all the Secretaries of the various Associations for their loyal support and hard work, so cheerfully carried out, and often in face of many difficulties, and also for supplying the reports that follow.

R.A.F. BOXING ASSOCIATION.—The season 1931-32 opened in a most unusual manner, as the pick of our boxers were engaged in matches against some of the best boxers in Scandinavia before they had commenced the season's work at home.

The invitation to send a representative team to Norway was extended by the Ornulf Boxing Club, Oslo, and the itinerary originally included a two-day competition in Bergen, a three-day competition in Oslo, and others at Gothenburg (Sweden) and Copenhagen (Denmark).

Unfortunately, the matches in Sweden and Denmark failed to materialize through no fault of ours or the Ornulf Club, but of the Committees of clubs in the countries already mentioned.

Our team were without exception the fittest and best-trained side I have handled.

All boxed very hard and our training programme of two sessions a day rather surprised our Norwegian friends, but the results were good, as everyone stayed the long rounds of three minutes very well, and no difficulty was experienced with the scales.

There is no doubt that, in accepting the invitation to participate in this tour the Association met many difficulties, not least the slight difference in the value of points from a referee's standpoint. These were not in our favour; nevertheless, it has been proved that the material is available if the exigencies of the Service permit of the necessary teaching and training. Our trainer, Honeyman, deserves a word of praise for the way he handled his team in the ring and in the gymnasium. The Norwegians were always anxious to have him in their corner when he was not wanted for our men.

The outstanding performer of the team was A. C. Graham, who was

undefeated throughout the tour. All the others boxed very well indeed, and the two officers, F./Officer MacLean (light heavy) and F./Officer Williams (heavy) were great favourites with the audiences.

The sum total of our endeavours was 24 fights, of which 15 were won and 9 lost.

Although the tour was cut short, its object—to create enthusiasm and keenness—was undoubtedly achieved.

The next important fixture, the Lord Wakefield Competition, was held at Henlow on December 2nd and 3rd. This popular competition created the usual enthusiasm and the boxing was quite up to standard.

The three trophies were won by Henlow (Officers), Halton "A" (Open), and Sealand (Junior).

Duxford were runners-up in the Officers, and Halton and Henlow tied for second place in the Open, while Felixstowe were only two points behind Sealand in the Junior.

The first match of the season was fought at the Stadium Club on December 4th, against the Civil Service, to whom we lost by 5 points to 6. Here we were handicapped by the small number of boxers produced by the Civil Service, as the men entered by them were of very good class, while we were only able to produce one R.A.F. champion, Sergt. Harper.

On December 8th we met the Brigade of Guards at Uxbridge and beat them by 17 points to 16.

Our next fixture was with the Belsize Club at their London headquarters. The Club is the oldest in London, and always has a fine selection of boxers at all weights to choose from. We were beaten by 16 points to 11.

The first match of the New Year was against Cambridge University at Henlow, and the side was, with one exception, composed of officers. This was probably the best officers' side the Association has ever turned out. All were fit and boxed splendidly to beat the Varsity by 19 points to 15.

We now turned to our Championships, and the first to be held was for Apprentices at Halton. For the first time the Apprentices were competing for a handsome trophy, a boxing figure presented by F. Sigrist, Esq.

In a very keen competition this was won by Halton, and the winners of weights were selected to represent the R.A.F. at the Boys' I.S.B.A. Championships held at Woolwich on February 26th, where we returned two winners, A./A. Clark Hilton (Ruislip) and A./A. Orbell (Halton), as against none last season, when the trophy was won by the Navy with 27 points, with the Army as runners-up with 19 points, and the R.A.F. 18 points.

The Individual Championships were fought off at Uxbridge on February 18th and 19th. The meeting was well patronized, but few new boxers of merit were discovered.

All the Airmen's Championships changed hands, with the exception of the welter, which has now been held by Sergt. Harper for three years.

Similarly, new champions in the Officers were found at every weight except light heavy, which again fell to F./Officer MacLean.

April 7th and 8th saw the holding of the I.S.B.A. Championships at Aldershot, where the Army won the trophy with 21 points, the R.N. and R.M. being runners-up with 9 points, and the R.A.F. and Territorials

tying with 6 points each. Our only winner was F./Officer MacLean, who won the officers' light heavy for the second time.

The finals of the Open Team Championships were held at Uxbridge on April 22nd between Henlow and Grantham; Henlow winning for the sixth successive season.

Fighting Area found the finalists in the final of the Junior Team Championships, the opposing sides being Northolt and Upavon. This was a very popular match, and Northolt fully deserved their win.

The season should have been finished with a match for the Sassoon Cup between the Champion Army Regiment (2nd Bn. The East Lancashire Regiment) and Henlow (Senior R.A.F. Champions). Unfortunately the match was cancelled by the Army, so Henlow retained the trophy.

Speaking generally, the season may be termed successful, but more new blood is urgently required, especially to bridge the great numerical handicap against which we always labour in our matches with the Senior, and numerically stronger, Services.

R.A.F. CROSS-COUNTRY ASSOCIATION.—*Royal Air Force Cross-Country Championships, 1932.* The thirteenth Annual Cross-Country Championships of the Royal Air Force were held in the beautiful grounds of Halton Camp on March 16th, 1932.

Great interest was taken in the race this year, since the Inter-Services Championship was due to take place on the same course three weeks later.

The entry was a good one, consisting of 245 runners from all units of the Royal Air Force, who had come to compete for the two Inter-Unit Championships into which the event was divided.

Sergt. S. Ferris, the marathon runner, finished first to win his fifth championship in 35 min. 2 sec., followed closely by A.C. Langley and A./A. Kirkus, who finished second and third respectively.

The first three individuals home were:—

1. Sergt. S. Ferris (Uxbridge); 2, A.C. R. K. Langley (Henlow); 3, A./A. N. M. Kirkus (Halton).

Team placings:—

- Open Competition.*—1, Halton, 80 points; 2, Henlow, 151 points; 3, Uxbridge, 176 points.

- Junior Competition.*—1, Martlesham Heath, 61 points; 2, Worthy Down, 67 points; 3, Upavon, 149 points.

Inter-Services Cross-Country Championships.—The Inter-Services Cross-Country Championship was run over a six-mile course at Halton on Wednesday, April 6th, 1932, and ended in a tie between the Army and the Royal Air Force, with 39 points each. The Royal Navy was third with 93 points.

The course was in good condition considering the recent rain, but a high wind prevented better times. Sergt. R. R. Sutherland, who won the race last year, was near the front all the way, and won quite easily from Sergt. S. Ferris, the Air Force marathon runner. When the competitors had run about a quarter of the distance, Sutherland, Cpl. Wilson, A.C. Moore and A.C. Cowan were leading a big group, and by that time it was clear that the Navy were not going to be concerned in the finish. Their first man, A.B. Edwards, was a long way behind the leaders, and they filled the last six places.

After covering four miles, Sutherland was still ahead of Ferris and

going easily. Cowan was holding fourth place for the Air Force, but there were two Army men close behind him and there seemed no reason to suppose that the Army, who were expected to win the Championship for the third year in succession, would be beaten. The Air Force, however, improved their position over the last mile and a half, and very nearly won. Ferris could not catch Sutherland, but Cowan, who was only a yard behind Ferris, took third place, and, after Sergt. Holmes, of the Army, came two more airmen. The Army just saved themselves by getting the next four places, but their last man to score, Sergt. W. M. Cotterell, a past winner of the event, got home by only two seconds from A./A. Kirkus. If Cotterell had been caught the Air Force would have won.

The Navy team came in slowly a long way behind, and their best man, Edwards, could do no better than finish 16th. The teams consisted of eight men, of whom the first six counted.

The team placings were:—

Equal 1, Army (1, 4, 7, 8, 9, 10=39 points) and Royal Air Force (2, 3, 5, 6, 11, 12=39 points); 3, Royal Navy and Royal Marines (13, 14, 15, 16, 17, 18=93 points).

The individual placings of the leaders were:—

1, Sergt. R. R. Sutherland, 3rd Carabiniers (Army), 35 min. 37 sec.; 2, Sergt. S. Ferris (R.A.F.) (Uxbridge), 35 min. 42 sec.; 3, A.C. R. A. Cowan (R.A.F.) (Henlow), 35 min. 43 sec.

Annual Cross-Country Match—Royal Air Force v. Aldershot Command.—The annual cross-country match between the Aldershot Command and the Royal Air Force took place in fine weather at Northolt on February 3rd, 1932.

Both sides were at full strength, and the match resulted in a win for the Royal Air Force, who also furnished the first man home.

The order of finish was:—

1, Sergt. S. Ferris (R.A.F.), 32 min. 51 sec.; 2, L./Cpl. Elwin (Aldershot Command), 32 min. 55 sec.; 3, A.C.2 Crewsdon (R.A.F.), 33 min. 28 sec.

Team placings:—

1, Royal Air Force (1, 3, 6, 8, 9, 10=37 points); 2, Aldershot Command (2, 4, 5, 7, 11, 15=44 points).

Annual Triangular Cross-Country Match between the Royal Air Force, Middlesex County, and the Civil Service.—This triangular match took place at Northolt on March 23rd, 1932. The course was one of six and a half miles, with fairly heavy going. The race was a good one and resulted in a win for Middlesex County, the Royal Air Force being second, and the Civil Service third.

Sergt. S. Ferris (R.A.F.) was first man home in 39 min. 12 2-10 sec.

ROYAL AIR FORCE FENCING UNION.—*Report for season 1931-32.* The season 1931-32 may be considered the most successful yet experienced in Royal Air Force fencing.

Each competition has brought forward record entries, particularly from officers. This would point to the fact that pilots are realizing that fencing is the best recreation for maintaining flying fitness.

In order to stimulate general interest early in the season, a friendly inter-station match was arranged in December between teams from Henlow, R.A.F. Depot, Uxbridge, Worthy Down and Andover combined, Calshot and Lee-on-Solent combined. A most interesting day's

fencing resulted, in which Uxbridge were the ultimate winners by a narrow margin of points.

The Novices' Competition, held on January 13th and 14th, brought forward a record of ninety-one competitors. The most outstanding competitor was L.A.C. Goode, of Andover, the winner of the Senior Foil, whose orthodox and determined fencing should enable him to become a future R.A.F. champion.

The Apprentices' Competition, held at Halton in February, produced some keen fencing, which, if lacking in technique, showed plenty of enthusiasm. L.A./A. Kirk (Halton), the winner of each event (Foil, Epée, and Sabre), possesses a lightning parry and riposte, which carried him to victory against his rather inexperienced opponents.

The Inter-Unit Team Championships, held at Uxbridge on March 1st and 2nd, again proved a most popular event, the entries having increased this year to thirteen, as against eight last year. The keenness and team spirit displayed were pleasing features of the meeting. The defeat of Uxbridge, holders of the Senior Trophy, by Henlow in the first round was a surprise; the fight in which F./Officer Berkeley (Henlow) defeated F./Officer Bellairs (Uxbridge) in the Foil being a fine display of swordsmanship. Henlow, the ultimate winners of the Senior Trophy, although possessing no outstanding swordsmen, were carried to victory by their enthusiasm and remarkable combativeness. Martlesham Heath, the holders of the Junior Trophy, were again successful. They are fortunate in possessing that fine all-round swordsman, S.M. Stollery, who was undefeated throughout the contests.

The Royal Air Force team have fenced in 27 matches, winning 18, losing 8, and drawing 1. Both Inter-Services matches were won, in each case by 20 points to 16. The results were as follows:—

Against the Royal Navy and Royal Marines: Foil, 7 wins to 2; Epée, 6 wins to 3; Sabre, 4 wins to 5; Bayonet, 3 wins to 6.

Against the Army: Foil, 4 wins to 5; Epée, 7 wins to 2; Sabre, 4 wins to 5; Bayonet, 5 wins to 4.

The outstanding feature of these matches was the consistent form of F./Sergt. Stubberfield, the Inter-Services Epée Champion, who was undefeated in the Epée in both matches.

ROYAL AIR FORCE FOOTBALL ASSOCIATION.—The fixture list for the past season was a very much stronger one than hitherto, and a number of first-class professional clubs were met.

The Army were defeated by a goal to nil, but the Navy match resulted in a heavy defeat by 5 goals to 1. The R.A.F. played fast and clever football against the Army, and fully deserved their victory. Against the Navy, however, the team fell to pieces after they had had a couple of unlucky goals scored against them.

The English Football Association XI, practically an amateur international side, were beaten by 3 goals to 1. This is the first time on record that the R.A.F. have defeated the Football Association.

The very strong Athenian XI were also defeated by 3 goals to 1. This was a new fixture in place of the game with the Spartan League, and, judging by the large attendance at the match, will prove a much more popular one.

Against some of the weaker sides that were met, however, the R.A.F. XI showed poor form.

Several members of the R.A.F. XI were chosen by the English Football authorities and the various counties.

A.C. Henderson, the goalkeeper, was selected to represent the Football Association, and the Athenian League.

Sergt. James played for the Football Association, and for Cornwall. Cpl. Baldwin played for the Football Association, the London F.A., Surrey, and the Isthmian League.

A.C. Parrish played for the Football Association, the Isthmian League, and Surrey.

A.C. Chaston played for Middlesex; Cpl. Pond for the Spartan League; L.A.C. Hamlett for Cornwall; and A.C. Hickey for the Spartan League.

The representative XI were invited by the Club Francaise, one of the premier clubs in France, to play a game in Paris on May 8th, but the guarantee offered was not sufficient to cover expenses, and the offer had to be declined.

Boscombe Down put up a great performance in carrying off both the Senior and Junior Cups. The Station XI defeated Upper Heyford by 3 goals to 1 in the Senior final, and No. 9 (Bomber) Squadron beat Bicester 2—1 in the replayed Junior final after a draw 0—0 in the first game.

Representative results: played, 15; won, 4; lost, 10; drew, 1; goals for, 27; goals against, 43.

ROYAL AIR FORCE HOCKEY ASSOCIATION.—Although the R.A.F. lost several matches and had a somewhat high total of goals scored against them during the past season, it was on the whole a successful one.

It is perhaps not generally realized that matches are arranged with counties and first-class London clubs, to give players, especially those from isolated stations, the opportunity of playing in first-class hockey and gaining experience for the Services Championship, which is the main objective of the season.

This season the Army won the Championship, and the Royal Air Force were runners-up.

The match against the Royal Navy and Royal Marines was played at Uxbridge, and after a very fast game resulted in a win for the Royal Air Force by 2 goals to 0.

P./Officer Clarke in goal played extremely well, and the backs and halves combined well and held the Navy forwards.

The R.A.F. forwards did not settle down until after the first quarter of an hour, after which they played their best collective game of the season. P./Officer Drew scored in the first half, and L.A.C. Stevenson in the second.

The match against the Army was to have been played at Aldershot on February 10th, but owing to a snow-storm the game was postponed and played at Stanmore on March 5th, when the Army won by 3 goals to 0. The R.A.F. did not show the same standard of play as they did against the Navy. They were inclined to be slow and their passing was not always accurate. The goalkeeper, P./Officer Clarke, again played well and saved many fine shots by the Army forwards.

Inter-Unit Tournament.—These tournaments were again very successful and produced a number of good and interesting games.

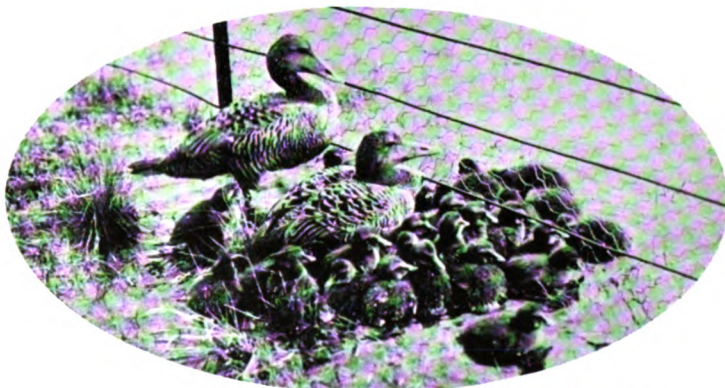
There were fourteen entries for the Open Tournament, and in the final Henlow beat Sealand by 1 goal to 0.

The Junior Tournament was won by Worthy Down, who beat North



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**A VERY TAME WILD EIDER ON NEST, NEAR AIR-FIRING TARGETS ON R.A.F.
BOMBING RANGES, TENTSUMMER, FIFESHIRE.**



[Copyright reserved.]

**YOUNG EIDER DUCKS EN ROUTE FOR THE SEA, HELD UP BY
FORESTRY COMMISSION RABBIT WIRE.**



[Copyright reserved.]

ARCTIC TERN AT NEST ON SAND DUNES.

Weald by 3 goals to 0. There were twenty-four entries, which was one more than last season.

R.A.F. OFFICERS' GOLF ASSOCIATION.—The Spring Meeting of the Association was held at Bramshott Golf Club, Fleet, Hants, on April 11th, 12th and 13th, 1932.

The Committee, Captain, and Secretary, as well as the staff of the Club, did everything they could to help make the meeting a success, and undoubtedly from all points it was one of the best meetings of the Association. There were between seventy and eighty entries, and some very good scores were returned.

The first day's weather was, to say the least, decidedly inclement—snowstorms, hail, rain, with a half-gale of wind—but all enjoyed battling with the elements. The weather improved each day, and the last day was really good.

The R.A.F. Serving Officers' Championship was well fought in all its stages and undoubtedly the winner, P./Officer W. F. Pharazyn, deserved his victory, as he played very well all through. The holder, F./Officer G. F. Humphries, came up against a very strong opponent in Sqdn.-Ldr. C. Boumphrey in the semi-final, and was beaten by 2 and 1. Boumphrey could not quite pull it off in the final, and lost by the same margin, 2 and 1, over 36 holes.

The Station Team Challenge Cup was won by Filton with a net score of 496 for the three players; this was quite good, considering the very bad weather conditions.

F./Officer Laws, with two rounds of 82, won the scratch prize for 36 holes.

F./Lieut. C. D. Adams took the 1st Division 36-hole handicap prize with 163 net, and F./Lieut. Gemmel the 2nd Division handicap with 160 net.

The conditions were much better on the second day, although the scores were not quite so good in the morning. Sqdn.-Ldr. C. H. Hayward, playing from +2, won the 1st Division Handicap Bogey Singles with all square, and Sqdn.-Ldr. Stevens and F./Lieut. Whitaker tied for the 2nd Division prize with 2 down.

The scoring for the four-ball foursomes was slightly better, Sqdn.-Ldr. Sugden and P./Officer Pharazyn tying with Wing-Comdr. Pulford and F./Lieut. Ackers at 2 up.

The third day's results were not quite as good as they should have been, but the greens were a little more difficult; they had become very fast, which might have made a small difference as regards scoring.

F./Lieut. Macpherson returned a good score of 76 to win the scratch prize. F./Officer Drew, with a 75 net, won the 1st Division prize, and Wing-Comdr. D'Albiac, with another good round, won the 2nd Division prize with 76 net.

Wing-Comdr. Drummond and F./Lieut. Yool returned a good net score of 73 to win the men's foursomes.

Sqdn.-Ldr. C. H. Hayward and Mrs. Frank Hayward pulled off the mixed foursomes with a net score of 79½.

The final round of the National Playing Fields Cup, presented by the Earl of Derby, K.G., was won by Wing-Comdr. R. E. Saul, the runner-up being Sqdn.-Ldr. Cockey.

Inter-Service Matches.—The Inter-Service match against the Royal

Navy and Royal Marines was played at the Royal Berkshire course on April 14th, the Royal Navy being victorious by 8 to 4. The R.A.F. started off well, by winning three out of the four foursomes, but came hopelessly to grief in the singles, winning only one match, the Royal Navy taking all the other seven.

The match against the Army was played at West Hill Golf Club course on April 25th, and resulted in a very comfortable win for the Army by 11 to 1. The Army won all four foursomes and seven of the eight singles.

R.A.F. POINT-TO-POINT MEETING.—With the kind permission of the Blankney Hunt, the R.A.F. Point-to-Point Races were held in conjunction with the Hunt Meeting on April 2nd.

As in the past year, there was only one R.A.F. race, in which the three cups were competed for. The result of the race was as follows:—

1. "Harrietta," owned and ridden by Group-Capt. R. H. Verney (winner of the Londonderry Cup).
2. "Gypsophila," owned and ridden by Air Vice-Marshal A. M. Longmore (winner of the Longcroft Cup).
3. "Billy," owned and ridden by Wing-Comdr. A. W. H. James.
4. "Kestrel," owned by Air Vice-Marshal Longmore and ridden by Sqdn.-Ldr. H. G. White (winner of the Sutherland Cup, Novices).

Number of runners, nine. The Team Cup was won by Cranwell.

R.A.F. RUGBY UNION.—In reviewing the 1931-32 season we must refer to the loss of F./Officer Ievers, who had been a regular member of the side for three seasons. His play was always characteristic of himself, fearless and straight. We very much regret his passing. We also feel the loss to football very much of F./Officer Bader. Although he is no longer able to play, his cheery disposition and indefatigable spirits will be of great use to us, we hope, for years to come in the ranks of the "urgers-on" on the touch-line. He was always a full-out player, and a type which many aspiring players could copy with good results. We were also deprived of the services of F./Officer Elsmie for the season through a broken ankle. He is, however, fit again, and we hope he will start next season with renewed vigour. The loss of a scrum-half and a fly-half who had played together so well the previous season was a very serious handicap to the R.A.F. team, and, although many players were watched, difficulty was encountered in finding two efficient substitutes. This will give some idea of the difficulties of the selector's task. Although there were many changes during the season, the selector made only five voluntary ones. The rest were caused by illness, injury, examinations, internationals, international trials, etc. It will be seen, therefore, that the criticism levelled at him for changing the side is entirely unfounded. Those critics who attend the games and are informed of the reasons for changes fully understand the difficulties.

Judging the season by results it was not as successful as the previous year, but we have no cause for despair for the future. We have included young players in the side who are gaining experience which we hope will be of great benefit to them in the coming season when we play against teams that are first-class exponents of the game. That we are always welcome is shown by the reception we get and also by the increasing number of sides who are asking to play us.

We congratulate F./Lieut. Beamish on being made captain of Ireland

and the Combined Services, and we also congratulate F./Lieut. Hodder and F./Officer Bader on being capped for the Combined Services against the South Africans.

The results of the season were:—

Won, 3; lost, 12; drew, 0; points for, 115; points against, 236.

As was the case last year, we look forward with confidence to the next season.

One very important point should be stressed. New players are wanted not only for regular places in the side, but also capable of putting up a good game if called on at short notice to fill a vacancy in the team. It is the duty of all Rugby Secretaries to inform the Hon. Secretary of any player whom he considers worthy of a trial or watching. His name should be sent in *at once* and at any time in or out of the season. We shall not be able to get much farther until we have really efficient reserves to replace regular players who are, for some reason or other, unable to play.

The R.A.F. Rugby Union is always willing to give financial assistance to help on Rugby in small units whose P.S.I. funds are low, and in addition to assist with the travelling expenses of units in the Cup Competition under the circumstances specified in the Handbook.

Henlow is to be congratulated on winning the Inter-Unit Cup Competition for the second year in succession, and Boscombe Down are deserving of much praise in reaching the final, taking into account the recent formation of the station and the small numbers available from which to select a team.

Our thanks are due to the Hon. Secretary, who devotes a very large amount of his time to R.A.F. rugby, and who keeps the team cheerful and bright even under the most adverse circumstances.

R.A.F. SQUASH RACQUETS ASSOCIATION.—There is no doubt that the standard of squash racquets is improving, and for this we must thank the R.A.F. Sports Board for their generous financial assistance to stations in helping them to build courts; without this help, it would have been impossible to have the excellent courts which practically every regular station now possesses.

For the first time in the Inter-Services Tournament, which is played annually at the Army and Navy Club, we gave the Army some anxious moments. It was most appropriate that Group-Capt. Robinson, who has been the leading figure for so many years in R.A.F. squash racquets, should be the first man to win a match against the Army. The match was won by the Army by 3 to 2 after a most exciting series of games.

Lieut. G. C. Jameson (R.E.) beat P./Officer P. B. Coote 8—10, 9—0, 9—5, 9—6.

Lieut. C. P. Hamilton (R.A.) beat P./Officer J. W. More 9—2, 9—2, 9—3.

Capt. J. B. Hyde-Smith (R.A.) lost to Group-Capt. F. L. Robinson 5—9, 7—9, 9—3, 4—9.

Capt. J. N. Cheney (King's Royal Rifle Corps) lost to F./Lieut. H. M. Mellor 9—1, 4—9, 10—9, 7—9, 5—9.

Lieut. J. R. Caines (8th Hussars) beat F./Officer E. C. Hudleston 9—0, 7—9, 9—1, 9—2.

We won the match against the Royal Navy by 5 matches to 0.

Final result: Army, 8; R.A.F., 7; R.N., 0.

Although we are improving, we are not nearly fast enough; our chief weakness is in the general standard of play in the Service. There are about half a dozen players of tournament standard, but after that there is a big gap, and we have few reserves. We do want players, particularly young ones, to go into the courts with the idea of playing the game. To play just for exercise leads to wild shots all round the court and considerably less energy is expended than if the game had been taken seriously.

The Service is also handicapped in the geographical isolation of most stations. This means that players find it difficult to get practice which will extend them. One way of overcoming this is to join a good squash racquet club, such as the Jesters.

The R.A.F. Championship took place at Queen's Club on November 30th and following days, and was won by P./Officer P. B. Coote, who beat Group-Capt. F. L. Robinson in the final by 9-3, 10-9, 4-9, 10-9. Coote has improved a lot in the past year and should go far. The three-day meeting was a most enjoyable one, and a number of new players were seen. Evidence of lack of good practice and failure to know what to do with easy shots were prevalent, but there was no lack of keenness.

The system of allocating so many places to each squash area and playing off the later rounds at Queen's Club is a little difficult to administer and does not always bring the best talent to the final rounds. Other schemes have been suggested, but so far no satisfactory alternative has been devised. If any reader has a solution we should be glad to hear from him.

We do hope to see a further all-round improvement this year. The British Amateur Championship is held by Amir Bey, the Egyptian, a wonderful player. Let us try to produce someone to help win it back.

ROYAL AIR FORCE SWIMMING ASSOCIATION.—The Royal Air Force Swimming Association Championships were held at the Halton Command Swimming Baths on Friday, October 2nd, 1931. Previously heats had been held to eliminate a number of competitors who had entered from various stations.

The number of stations entering was twenty-one, as against twenty in 1930; an increased number of entries was also received, but, with the exception of one swimmer, the standard in speed had not risen.

Three Air Force records were broken during the meeting. The 100 Yards Free Style time was reduced from 66 1-5 sec. to 63 1-5 sec. by A.C. Barnsley, of Manston, who also reduced the 440 Yards Free Style from 6 min. 33 sec. to 6 min. 27 1-5 sec.; and A.C. Haines, of Upper Heyford, reduced the 100 Yards Breast Stroke from 1 min. 23 sec. to 1 min. 21 1-5 sec.

The Association is now in possession of a trophy for all the events held at these Championships, but has not yet obtained the trophies for the Half-Mile and One Mile Races.

The Diving was judged by members of the Amateur Diving Association, and the prizes were presented by Air Commodore MacEwen.

The Inter-Services Swimming Championships were held at the Halton Command Swimming Baths on Monday, October 12th, 1931, and resulted in a very close finish, with the following results:—

Army, 79½ points; Royal Air Force, 71 points; Royal Navy and Royal Marines, 49½ points.

Two records were broken, Stoker Patchett, of the Royal Navy, lowering the 220 Yards Free Style from 2 min. 47 1-5 sec. to 2 min. 45 3-5 sec., and Sapper May, of the Army, broke the Inter-Services record in the 440 Yards Free Style, bringing the time from 6 min. 16 sec. to 6 min. 11 4-5 sec., and a most creditable performance in this race was obtained in the second place by A./A. Cousins, who also broke the Inter-Services record, his time being 6 min. 13 4-5 sec.

The results of the water polo matches were:—

Army, 2; R.A.F., 0. R.N. & R.M., 3; Army, 1. R.N. & R.M., 3; R.A.F., 1

ROYAL AIR FORCE RIFLE ASSOCIATION.—In the October, 1931, issue of this **QUARTERLY**, complete results were given of the Miniature Rifle League, 1930-31, together with the results of the eleventh meeting of the Royal Air Force Rifle Association at Bisley.

The results obtained at this meeting augured well for the Service in the Imperial Meeting held at Bisley on the National Rifle Association ranges, in July, and, although the Royal Air Force teams did not come up to expectations in the chief Inter-Services matches, the meeting was in all other respects one of the most successful since the inception of the Association.

In the Gunmakers Cup Revolver Competition, open to teams of four from all Services, an Inland Area team, under the able leadership of Sqdn.-Ldr. C. W. Hill, defeated all-comers and were awarded the cup and medals. The same team obtained second place in the Bargrave Deane Revolver Competition, which is also open to all the Services, and received the National Rifle Association Bronze Medals. In the individual events over £450 was won in money prizes by twenty-six serving and twenty past members.

Sqdn.-Ldr. C. W. Hill, of Henlow, was successful in winning the St. George's Challenge Vase, Dragon Cup, and Gold Cross after a tie shoot at 900 yards. This is one of the most coveted competitions on account of the beautiful trophies that are offered, the Gold Cross being retained by the winner.

His Royal Highness the Prince of Wales's Prize of £100 was won by Sqdn.-Ldr. C. S. Richardson, who came home on leave from Iraq specially for the meeting. This prize comes next in monetary value to that of His Majesty the King's Prize, which is £300. This officer also won the Association Cup, competed for at 600 yards.

In the B.S.A. Competition, which is a seven-shot competition at 600 yards with Service rifles and open sights, F./Sergt. A. Worden, Central Flying School, scored 33 points out of a possible 35, and won the prize offered, which was a special B.S.A. Service rifle value £10 10s. This was a notable win for the Service, considering that F./Sergt. Worden was competing against the crack shots of the Army and Navy in their own particular form of Service shooting. The absence of this N.C.O. on his posting overseas will be a big loss to the Service in all Inter-Service matches.

Sergt. C. C. Willott (Eastchurch) excelled with his revolver in all the chief competitions, winning the Revolver Gold Badge and the Revolver Gold Medal. The former is awarded to the competitor with the highest aggregate over a number of shoots throughout the meeting, and the latter is presented for a straight shoot at 10, 20 and 50 yards,

the possible being 120. Two rapid shoots are included, and Sergt. Willott is to be congratulated on a score of 99 under the conditions. These two competitions are open to all-comers, which include the crack shots of all the Services.

Past members of the Service were well represented in the prize lists, Cpl. F. A. Reynolds, late of the Record Office, winning the Conan-Doyle Statuette with a score of 69 out of a possible, 70, while it is worthy of note that in the St. George's, won by Sqdn.-Ldr. Hill, the seventh and ninth places were taken by F./Officer G. Richardson and Lieut. Booth respectively, both ex-R.A.F.

It is also worthy of note that this is the first time since the "Victory" Meeting of 1919, when Sqdn.-Ldr. Pearce won the Cortis Challenge Cup, that a serving member has gained a first prize for rifle shooting.

In His Majesty the King's Prize, which is the most coveted honour at Bisley, only two serving members survived the two eliminating stages and qualified to shoot in the final at 900 and 1,000 yards. Sqdn.-Ldr. C. S. Richardson and F./Officer H. H. Ellison were placed 29th and 72nd respectively in the "King's 100," and each received the King's Silver Badge.

International Honours.—The Service was well represented by serving and past members in the international matches, the undermentioned being awarded International Badges:—

Elcho Challenge Shield (match rifle) (open to one team of eight from England, Scotland and Ireland; distances: 900, 1,000 and 1,100 yards).—Air Vice-Marshal F. C. Halahan (Ireland); Sqdn.-Ldr. J. L. K. Pearce (Ireland) (Reserve).

The Mackinnon Challenge Cup (S.R.b.) (open to one team of twelve from England, Scotland, Ireland and Wales and the Colonies; distances: 900 and 1,000 yards).—Sergt. C. C. Willott (England); Lieut. G. F. Booth, late R.A.F. (England); P./Officer C. H. Lewis, O.U.A.S. (Wales); Air Vice Marshal F. C. Halahan (captain) (Ireland); Sqdn.-Ldr. J. L. K. Pearce (Ireland); F./Officer H. H. Ellison (Ireland).

The National Challenge Trophy (S.R.b.) (open to teams of twenty from England, Scotland, Ireland and Wales; distances: 200, 500 and 600 yards).—Lieut. G. F. Booth, late R.A.F. (England); F./Officer G. Richardson, late R.A.F. (England); Sqdn.-Ldr. C. S. Richardson (England); Air Vice-Marshal F. C. Halahan (captain) (Ireland); F./Officer H. H. Ellison (Ireland); Sqdn.-Ldr. J. L. K. Pearce (Ireland); F./Officer J. E. McClure (Ireland).

Rajah of Kolapore's Imperial Challenge Trophy (open to teams of eight from the Dominions and Colonies and the Mother Country; 10 shots at 300, 500 and 600 yards).—F./Lieut. E. R. C. Hobson (Mother Country).

Society of Miniature Rifle Clubs, Bisley, 1931 (International Match for the Ian Hamilton Challenge Trophy) (open to one team of ten from England, Scotland, Ireland and Wales; 10 shots at 25, 50 and 100 yards).—Air Vice-Marshal F. C. Halahan (Ireland); Sqdn.-Ldr. J. L. K. Pearce (Ireland); Cpl. C. H. Sexton (Ireland); L.A.C. D. G. Erwin (Reserve) (Ireland).

During the Bisley Meeting a team was selected to represent the United Kingdom at the Canadian Rifle Meeting in August. The team consisted of four members from the Fighting Services and six ex-Service members under the captaincy of Commander Sir Lionel Fletcher, C.B.E.

The Royal Air Force was represented by F./Lieut. E. R. C. Hobson

and Sergt. Willott, who shot with great distinction, both as team members and as individuals. Sergt. Willott performed the unique feat of scoring ten five-shot possibles in succession, two each at 200, 500, 600, 900 and 1,000 yards, winning the Sweepstake Aggregate. This notable performance reflects great credit on the voluntary training of post-war products of the Service, Sergt. Willott being an ex-Aircraft Apprentice trained at Cranwell. The Service hopes that this airman will have the honour of bringing His Majesty's Prize to the R.A.F. at some future date. It has never yet been won by a member of the Regular Fighting Services. The highest place so far obtained by a serving member of the Royal Air Force is tenth.

In the other Services and in most rifle clubs there is a "close" season for rifle shooting during the year, but, thanks to the enthusiasm of Commanding Officers, officers, airmen and apprentices in this valuable form of voluntary Service training, there is no "close" season in the Royal Air Force.

The Imperial Meeting at Bisley usually concludes in the third week in July, and this usually means that rifles are placed away until the following spring. In the R.A.F., rifle enthusiasts turn their thoughts towards the smaller-bored weapon and commence preparing for the Miniature Rifle League, which is launched in September.

This league was inaugurated in the autumn of 1926 with a view to encouraging and developing rifle shooting throughout the Service by voluntary methods. In the first year of the league only thirty teams entered, but in the season just concluded there were sixty teams competing, which means that at least 900 individuals were practising rifle shooting throughout the winter months. There is no doubt that the successes of the R.A.F. personnel last year at Bisley are primarily due to this important practice during the "close" season.

The first stage of this league is organized within Groups and Areas and is conducted by an officer of the R.A.F. Rifle Association. As soon as the first stage is concluded the names of the winning teams from each Group or Area are forwarded to the Hon. Secretary, for entrance to the second stage, there being one team allowed for every four entering the first stage. The teams are then drawn and the second stage is conducted on the knock-out principle.

Messrs. Nobels, Ltd., the ammunition manufacturers, have very kindly presented a beautiful cup for this competition, and supply yearly one set of silver and two sets of bronze medals. One set of bronze medals is awarded to the team having the highest average in the first stage, the other two sets being awarded to the finalists in the second stage.

The Society of Miniature Rifle Clubs present their Silver Medal, which is awarded to the individual with the highest average in the first stage. The standard of shooting in the final stage this year has been phenomenal, the winners, No. 12 (B.) Squadron, having the remarkable average of 1,552 (ex 1,600) over the four matches, with a bad shoot in the final. The team is to be congratulated on defeating the Air Armament School. It is of interest that the same units were in the final last year. The scores were exceedingly close, there being a difference of only 3 points.

Of the teams making their exit in the semi-final, No. 10 (B.) Squadron were unlucky in being defeated with an excellent score of 1,556, this being the highest score in the second stage excepting that of the winners and runners-up. Special mention must be made of F./Sergt. B. Crane, of this unit, whose score in the three matches totalled 597 out of 600.

The teams forming the league were supplied by Areas as follows: Inland Area, 20; Bombing Area, 13; Fighting Area, 12; Coastal Area, 6; Halton, 5; Cranwell, 4.

Complete results of the first and second stages are given later.

The Halton Command have again entered every available Aircraft Apprentice in the Imperial Challenge Shield, the results of which will not be published till the autumn of the present year.

The undermentioned Apprentices have been awarded Royal Air Force Rifle Association Bronze Medals on account of having made the highest aggregates in this competition:—

A./As. T. Bellerby, G. Barman, S. Perfect, L. Gallaway, E. Brett, H. Crampton, H. Candy, J. Dowsing, P. Stadden and R. Heseltine.

This Command has also just concluded its second Annual Rifle .303-inch and .22-inch Meeting; the results are not yet to hand. The Command deserves great credit in organizing these meetings and for the encouragement it is giving to young apprentices in this valuable form of Service training.

MINIATURE RIFLE LEAGUE.

FIRST STAGE RESULTS.

Team Averages—Qualifying for Second Stage.

<i>Order of Merit.</i>	<i>Unit.</i>	<i>Matches Fired.</i>	<i>Total.</i>	<i>Team Average.</i>
1. *Air Armament School	...	7	10,835	1548.00
2. R.A.F. Base, Gosport	...	5	7,626	1525.00
3. No. 5 Flying Training School	...	7	10,670	1524.00
4. No. 12 (B) Squadron	...	12	18,285	1523.75
5. H.A.D., Henlow	...	6	9,105	1517.5
6. No. 10 (B) Squadron	...	12	18,122	1510.00
7. No. 25 (F) Squadron	...	8	12,010	1501.00
8. Record Office	...	6	8,989	1498.1
9. No. 41 (F) Squadron	...	8	11,950	1493.7
10. No. 2 (A.C.) Squadron	...	3	4,407	1469.00
11. Cranwell Workshop Squadron	...	3	4,381	1460.3
12. S.H.Q., Andover	...	12	17,726	1457.1
13. No. 24 (C.) Squadron	...	8	11,581	1447.6
14. R.A.F. Base, Calshot	...	5	7,237	1447.4
15. †No. 2 Wing, Halton	...	4	5,461	1365.2

* Ten Bronze Medals, highest team average first stage.

† Fired with Service rifles fitted with .22 in. tubes.

Highest Individual Averages from First Stage.

<i>Rank and Name.</i>	<i>Unit.</i>	<i>Matches Fired.</i>	<i>Team Average.</i>
*Sergt. C. C. Willott	A.A. School	7	196.0
Cpl. R. Anderson	A.A. School	7	195.5
F./Sergt. B. Crane	No. 10 (B.) Squadron	12	194.9
F./Officer A. J. W. Geddes	No. 4 (A.C.) Squadron	3	194.6
Cpl. T. M. Hull	No. 12 (B.) Squadron	12	193.7
Cpl. E. F. Hancock	No. 12 (B.) Squadron	12	193.2
Sergt. D. Edwards	R.A.F. Base, Gosport	5	192.8
L.A.C. Stubbings	Henlow	6	192.6
S.M.1 F. H. Ford	West Drayton	6	192.5
A.C.1 H. D. Roberts	R.A.F. Base, Gosport	5	191.8
F./Officer J. E. C. McClure	No. 41 (F.) Squadron	8	191.5
Sergt. J. Goude	No. 2 (A.C.) Squadron	3	190.5
L.A.C. J. Hadley	No. 25 (F.) Squadron	8	190.3
Cpl. H. Sorrell	No. 25 (F.) Squadron	8	190.2
L.A.C. W. Hall	Cranwell	4	189.0

* S.M.R.C. Silver Medal.

SECOND STAGE RESULTS.

<i>First Round.</i>	<i>Second Round.</i>	<i>Semi-Final.</i>	<i>Final.</i>	<i>Winners</i>
A.A. School (1,539) S.H.Q., Andover (1,478) Gosport (1,502) 2 (A.C.) Sqdn. (Scr.)	A.A. School (1,542) Gosport (1,528)	A.A. School (1,561)	A.A. School (1,536)	12 (B.) Sqdn.
24 (C.) Sqdn. (1,474) R.A.F. College (1,512) 5 F.T.S. (1,523) 10 (B.) Sqdn. (1,547)	R.A.F. College (1,514) 10 (B.) Sqdn. (1,547)	10 (B.) Sqdn. (1,556)		
Henlow (1,543) 41 (F.) Sqdn. (1,541) Halton (1,487) 12 (B.) Sqdn. (1,542)	Henlow (1,548) 12 (B.) Sqdn. (1,558)	12 (B.) Sqdn. (1,568)	12 (B.) Sqdn. (1,539)	
Ruislip (Bye) Calshot (1,445) 25 (F.) Sqdn. (1,544)	Ruislip (1,500) 25 (F.) Sqdn. (1,544)	25 (F.) Sqdn. (1,521)		

Winners: No. 12 (Bomber) Squadron, Andover.
(The Nobel Challenge Cup and ten Silver Medals).

Captain and Coach : Cpl. E. F. Hancock.

<i>Rank and Name.</i>	<i>Score.</i>		<i>Total.</i>
	<i>Deliberate.</i>	<i>Rapid.</i>	
L.A.C. C. Warsop	99	98	197
Cpl. D. Grundy	98	96	194
Cpl. E. Hancock	96	98	194
A.C. 1 F. Squibb	95	99	193
Sergt. F. Bacon	99	94	194
L.A.C. W. Lynch	97	96	193
Cpl. A. Taylor	91	96	187
L.A.C. A. Hull	93	94	187
Totals	768	771	1539
Averages	96	96.3	192.3

Reserves :—

Cpl. R. Hughes	92	94	186
Sqdn.-Ldr. D. F. Stevenson, D.S.O., M.C.	98	88	186

Second : Air Armament School, Eastchurch (ten Bronze Medals).

Captain and Coach : F./Lieut. J. C. Stevens.

<i>Rank and Name.</i>	<i>Score.</i>		<i>Total.</i>
	<i>Deliberate.</i>	<i>Rapid.</i>	
Sergt. C. C. Willott	100	100	200
Cpl. R. Bennett	98	98	196
Sqdn.-Ldr. T. S. Ivens	98	96	194
L.A.C. D. H. Paul	94	97	191
L.A.C. A. E. Johnson	96	94	190
F./Sergt. J. Goude	94	95	189
Cpl. H. A. Anderson	98	91	189
L.A.C. J. Reed	95	92	187
Totals	773	763	1536
Averages	96.5	95.37	192

Reserves :—

L.A.C. J. Allwood	94	93	187
F./Lieut. G. R. Ashton	95	78	173

The undermentioned scored "possibles" in the second stage. It will be noted that L.A.C. Hull, F./Sergt. Crane, L.A.C. Lynch and Sergt. Willott scored double possibles, which is a very fine achievement, especially that of Sergt. Willott in the final match. Record certificates are being awarded by the Society of Miniature Rifle Clubs.

FIRST ROUND.

							<i>Slow.</i>	<i>Rapid.</i>
F./Lieut. C. E. B. Winch, Henlow	...	...	...	...	...	...	100	—
L.A.C. Hearle, Sealand	...	...	...	...	...	...	100	—

SECOND ROUND.

							<i>Slow.</i>	<i>Rapid.</i>
L.A.C. P. Cronin, Hawkinge	...	...	...	...	...	...	—	100
L.A.C. A. J. Hull, 12 (B.) Squadron	...	...	...	...	...	...	100	—
Cpl. E. Hancock, 12 (B.) Squadron	...	...	...	...	...	...	—	100
L.A.C. D. Haldaway, Henlow	...	...	...	...	...	...	100	—
F./Sergt. B. Crane, 10 (B.) Squadron	...	...	...	...	...	...	100	100

THIRD ROUND.

							<i>Slow.</i>	<i>Rapid.</i>
Cpl. H. A. Anderson, Eastchurch	...	...	...	...	...	...	100	—
Cpl. R. Bennett, Eastchurch	...	...	...	...	...	...	—	100
F./Sergt. B. Crane, 10 (B.) Squadron	...	...	...	...	...	...	100	—
L.A.C. A. J. Hull, 12 (B.) Squadron	...	...	...	...	...	...	100	100
L.A.C. W. Lynch, 12 (B.) Squadron	...	...	...	...	...	...	100	100
Sergt. F. Bacon, 12 (B.) Squadron	...	...	...	...	...	...	100	—

FINAL.

							<i>Slow.</i>	<i>Rapid.</i>
Sergt. C. C. Willott, Eastchurch	...	...	...	...	...	...	100	100

CORRESPONDENCE

To the Editor of "The R.A.F. Quarterly."

DEAR SIR,

May I be allowed to comment on the interesting extracts from the Italian Press by Signor Carlo Genzini.

It is evident from the vivid and sympathetic way in which he portrays the various circumstances which may surround a fighter pilot over the lines, that he, himself, has suffered from some of these experiences.

His suggestion for a back-gun defence for *single-seaters* is particularly interesting to me, as I tried out a similar scheme at St. Pol, Dunkirk, early in 1918. Incidentally, during the trials, I ran a serious risk of unknowingly shooting, as he then was, Wing-Captain Lambe (now Air Vice-Marshal Sir Charles Lambe). I doubt, even to this day, if he is aware of the risks he ran that day on his unannounced inspection of the surroundings of the depot aerodrome.

The trials I carried out were done with a Lewis gun fixed in the flying axis of a Sopwith 1½ strutter, fitted to fire the gun just to one side of the tail plane. I used a 1½ strutter in order that the passenger could re-load the Lewis gun as often as necessary. The target was an ordinary aerial target suspended from a kite wire.

My method of attack was to dive under the target and either climb and shoot back and down on the target, or throttle back and dive and shoot back and up at the target. No reflecting mirror was used for sighting purposes; sighting being carried out by looking back over the tail, and aligning the tail on the target.

I cannot remember the percentage of hits scored, but I can remember they were very small, but sufficient to induce me to start preparations for mounting a gun to "fire through" the tail of one of the two camels I had recently had allotted to me. I was then going to paint in a dummy passenger and cockpit. Unfortunately, or perhaps fortunately for me, I was unable to pursue my plans owing to circumstances beyond my personal control.

My idea was not that I should shoot the enemy down by this means, but merely drive him off my tail in circumstances similar to those suggested by Signor Genzini. As far as I know, nobody else took the idea up.

Yours truly,

P. F. M. FELLOWES.
Air Commodore.

Grantham, March 17th, 1932.

AIR NOTES

OVERSEAS COMMANDS.

MIDDLE EAST.

British Somaliland—Abyssinian Frontier Survey.

Weather conditions during March were generally unfavourable for air photography, and the progress of the Survey Flight was consequently retarded to a certain extent. As a result of the early "Gu" (spring) rains, which fell over most parts of the country during the greater part of the month, nineteen days were rendered unsuitable by heavy clouds, and two days by rain. In spite of this, however, eighty hours' flying were carried out, forty of which were on actual photographic flying, with the result that the frontier area between Bohotleh and a point approximately fifty miles west of that place has been practically completed.

SUDAN.

Reconnaissance of Sudan Coast.

During February and March three floatplanes of No. 47 (Bomber) Squadron carried out extensive reconnaissances of the western shore of the Red Sea.

The reconnaissances enabled the problem to be examined as to how the Royal Air Force could co-operate with the Sudan Government to give effect to any future law introducing new Customs duties by controlling pearl and other fishing in Sudan territorial waters. It will be remembered that a similar flight in October last opened up possibilities in the use of floatplanes in anti-smuggling measures in these waters.

The flight was accompanied by the Governor-Designate of Kordofan Province, and a thorough search of the Sudan coastline and all islands within fifty miles, for sea-going craft, was carried out, a task which it would have been hopeless to attempt except from the air. Many boats were visited at sea. Three were boarded, cargoes searched for contraband, and ship's papers examined for irregularities.

In the opinion of the Political Officer, these reconnaissances will have a good effect in the Red Sea. The news will spread that the Royal Air Force have inspected native vessels with armed aircraft that can alight on the sea, thus adding one more risk to smuggling.

ADEN.

Air Action against Thumair Village.

A caravan of forty camels was attacked by Qoteibi tribesmen at Thumair, in Qoteibi territory, on April 10th. At the request of the Political Resident, air action was taken by aircraft from No. 8 (B.)

Squadron against Thumair village on April 25th, as punishment for the attack and the refusal of the inhabitants to pay the fine which had been imposed.

The air action is reported to have had satisfactory results, and no further trouble is anticipated.

Visit by Flight of Troop-carrying Aircraft.

A flight of three Victoria aircraft of No. 216 (Bomber Transport) Squadron, Middle East Command, visited Aden between March 7th and 25th. During their stay, several long flights were made and co-operation with ground forces was carried out.

On March 11th the flight conveyed the Political Resident, Aden, the Protectorate Secretary and the Officer Commanding British Forces to Mukalla. On the following day a flight was made over the Hadhramaut, the aircraft returning to Aden on March 13th.

Between March 17th and 20th the flight visited British Somaliland, troop-carrying exercises being carried out with the Somaliland Camel Corps. This latter visit was considered to be of particular value by the Political Administration, having a very desirable effect on the native mind and, further, demonstrating how easily the transport of troops by air could be effected in the Protectorate.

On the return of the flight to Aden, a further troop-carrying exercise with the Aden Protectorate Levies took place on March 22nd.

The flight returned to Heliopolis on March 30th.

IRAQ.

Operations at Barzan.

Operations which had been planned during the winter months against Sheikh Ahmed, the recalcitrant leader of raiding Barzan tribesmen, began on March 15th. The forces engaged included an Iraq Army column, one flight of the Iraq Air Force, and one flight of No. 30 Squadron, Royal Air Force. The remainder of No. 30 Squadron and one flight of No. 55 Squadron, R.A.F., were held in reserve at Mosul.

On March 19th, whilst at Merga Sor, the Iraq Army camp was attacked before daybreak by a party of Shirwanis, estimated at 300 strong, who were eventually driven back.

A temporary police post was established at Merga Sor, and the column moved forward towards Birisia on March 30th. The column had reached Birisia on April 3rd, when it was forced to turn back to defend its supply portion, which had been heavily attacked at Wazhi. The tribesmen captured much transport and the column itself was only extricated from a most critical situation by the timely intervention of R.A.F. aircraft, who had observed the attack and who successfully delivered counter-attacks from a low height throughout the afternoon, continuing till dusk. On April 4th and 5th, R.A.F. aircraft dropped large quantities of food, blankets and ammunition on the column. On the 6th the column reassembled and moved southwards towards Zhazhok, but found the route barred by large bodies of tribesmen on the hills. The co-operating aircraft again came to their rescue, attacking and driving off the enemy, who suffered heavy casualties. The column arrived at Zhazhok without further opposition, where it has since remained, carrying out local reconnaissances.

In the meantime, on April 7th, an infantry battalion and one section Pack Battery joined the battalion already occupying Billeh, and this force was further reinforced a week later by two companies of infantry. This column, after carrying out reconnaissance as far as Barzan, and meeting with little opposition, occupied Barzan village on April 18th.

In the course of the reconnaissances, one Wapiti was forced to land amongst the rebels near Shirwan-a-Mazin, and the crew were taken prisoners.

Advantage was taken of Sheikh Ahmed's request for a doctor to attend one of these prisoners, who had been badly injured, to send a Political Officer with the doctor on a guarantee of safe conduct. The Political Officer returned by air on May 5th, bringing with him the doctor and two prisoners.

As a further result of his visit, negotiations have been opened, pending which air action has been suspended except for necessary co-operation with the Iraq Army column south of Rukutchuk River. It is hoped Sheikh Ahmed will be induced to comply with satisfactory terms.

PERSIAN GULF.

Arabia—Situation at Sur.

A long-standing dispute has existed between the Sultan of Muscat and the Bani Bu Ali, who occupy territory at the north-east corner of the Arabian Peninsula. The Headquarters of the Bani Bu Ali are at Aiqa on the coast opposite Sur, and at Jaalan, which is forty miles inland, and where Sheikh Ali has a fort.

The chief matter in dispute has been the refusal of Sheikh Ali of the Bani Bu Ali to recognize the suzerainty of Muscat or to admit the right of the latter to collect Customs dues at the port of Aiqa opposite Sur. The actual position at Sur in November and December, 1931, was as follows:—

- (1) Muqrimatain and the Jenebeh sections who live in Sur were quiet and appeared to be maintaining their loyal attitude towards the Muscat Government.
- (2) The tribes in the interior were taking a keen interest in the march of events.
- (3) Sheikh Ali was established at Aiqa with about 300 men. Thirty levies of the Muscat Infantry had been sent to Sur, but had returned to Muscat a few days later without having accomplished anything.
- (4) Sheikh Ali has addressed a truculent letter to the Muscat State, calling upon it to release a dhow captured by the State early in November.
- (5) The Political Resident, Persian Gulf, on the authority of the Home and Indian Governments, had informed Sheikh Ali that H.M. Government would not tolerate the defiance of the Muscat State. The question of what forcible measures were to be taken if the Sheikh proved to be obdurate in his refusal to allow a Customs post to be established at Aiqa was left for consideration until the effect of the warning was known.

In view of the uncompromising attitude of the Sheikh Ali it became necessary for the Political Resident in the Persian Gulf to inform him that H.M. Government were prepared to assist the Muscat State in the

pursuit of their just claims. After further abortive negotiations, an ultimatum was issued on December 14th, 1931, to Sheikh Ali to the effect that he was to accept the terms already presented to him, and that the Muscat State would proceed to erect a Customs house at Aiqa. He was informed that any resistance on his part would result in the demolition of Aiqa Fort by warship and the bombing of his fort at Jaalan, forty miles in the interior, by aircraft. It is noteworthy that hitherto he has considered himself secure from interference at Jaalan.

On March 6th demonstrations were made over Jaalan Fort by three Rangoon flying boats from No. 203 (F.B.) Squadron, and general proclamations were dropped warning tribesmen not to resist the establishment of the Customs post at Aiqa.

As a result of the pressure thus brought to bear, after some haggling Sheikh Ali accepted the Customs post and sent four men to escort the Customs guard ashore. He has been warned that payment of his allowances depends upon future good behaviour, and that any molestation of the Customs guard will involve punishment.

INDIA.

North-West Frontier.

Owing to unrest among the Painsa Khel, Dalka Khel and Sultan Khel tribes, aircraft of No. 2 (Indian) Wing Station were required to carry out reconnaissances over Dir territory from January 26th to February 12th. These aircraft were authorized to take retaliatory action if they were fired upon. On January 29th a party of men were located outside the village of Sandal in the Niag Valley, who opened fire on the reconnoitring aircraft, which took immediate action and inflicted casualties on the party. Aircraft were fired at on numerous other occasions, but no retaliatory action was taken.

On January 29th all aircraft of Nos. 1 and 2 (Indian) Wing Stations were ordered to stand by, and on January 30th 3,000 warnings in Urdu, Pushtu and Persian were dropped on certain specified villages in the Niag and Tormung Valleys, and also scattered broadcast. These warnings stated that air action would commence at noon on February 1st. News of the submission of the tribes was received on January 30th, and the orders for air action were therefore cancelled. The reconnaissances continued, however, until February 12th.

Aircraft from No. 2 (Indian) Wing were detached to Jhelum in connection with the unrest in Kashmir from January 29th to February 4th. During this period reconnaissances were carried out. On February 4th a flight of No. 28 (A.C.) Squadron was sent to Jhelum to co-operate with No. 3 Infantry Brigade. Daily reconnaissances were carried out from this date to the end of the month. Aircraft were employed in the delivery of orders to State Forces.

During the period under review, aircraft have been regularly employed in dropping propaganda leaflets on all important villages in the Peshawar Valley in connection with the suppression of the Red Shirt Movement. Reconnaissances were carried out on numerous occasions in the affected areas.

Move of Headquarters, R.A.F., India.

Headquarters, R.A.F., India, moved from New Delhi to Simla on April 14th, 1932.

Nomenclature of Units.

The Heavy Transport Flight, India, will be known as the Bomber Transport Flight, India, with effect from April 1st, 1932.

FAR EAST.

Flying Boat Flight, Singapore-Australia.

Three Southampton Flying Boats of No. 205 Squadron left Singapore on March 15th on a training flight to Port Darwin, where they were met by six landplanes of the Royal Australian Air Force.

The object of the flight was to give the squadron experience in operating away from its main base and also to initiate by these flights similar liaison with the Australian Air Force as has been established with the South African Air Force by the flights to the Cape.

The route, reproduced below, is the same as that followed in previous flights to Australia, and involves 2,035 nautical miles each way, so that the aircraft completed the equivalent of about 4,700 statute miles, exclusive of any flying carried out at Port Darwin.

March 15th.—Singapore to Klaabat Bay.

March 16th.—Klaabat Bay to Batavia.

March 17th.—Remain Batavia.

March 18th.—Batavia to Sourabaya.

March 19th.—Sourabaya to Bema.

March 20th.—Bema to Kupang.

March 21st.—Kupang to Darwin.

Reconnaissance of the Andaman and Nicobar Islands.

An interesting air reconnaissance of the Adaman and Nicobar Islands was carried out by three Southampton flying boats from No. 205 (F.B.) Squadron. The flight left Singapore on December 3rd and returned via Subang (in Sumatra) and Penang, landing at Seletar on January 16th, having covered a total of approximately 17,000 sea miles or 244 flying hours, and reconnoitred many anchorages.

Events Abroad

FRANCE.

FORMATION OF A MINISTRY OF NATIONAL DEFENCE.

In February, 1932, following a change of Government, M. Tardieu became Prime Minister, and in forming his Government instituted an important change in French National Defence organization. He abolished the War Office, Admiralty, and Air Ministry, and formed a Ministry of National Defence with one National Defence Minister, assisted by two Under-Secretaries of State. The control of civil aviation and of the mercantile marine was transferred to the Minister of Public Works.

This change has been under consideration in the past, but does not seem to have been worked out in any great detail before its institution.

The Navy, Army, and Air Force will remain separate Services, and the War Office, Admiralty and Air Ministry will continue to function as before, but the Minister of Defence or one of his Under-Secretaries will make all necessary ministerial decisions. The Defence Minister himself will deal with all questions of command and operations for all three Services. One of the Under-Secretaries will deal with all questions of administration, and the other with all questions of material.

An Advisory Committee will be formed composed of the Chiefs of Staff of the three Services and their technical assistants to advise the Minister of Defence as necessary.

The principle is to co-ordinate rather than to amalgamate the three Services. It is expected that economies in expenditure will result. The present system appears very top-heavy, and now that the Government of M. Tardieu has been defeated at the elections it is possible that some modifications may be made when the next Cabinet is formed, probably under M. Herriot. It is possible that the Minister of Defence will be retained and that he will have three Under-Secretaries instead of two, one Under-Secretary being responsible for one of the three Services.

The removal of civil aviation from the control of the Air Ministry has caused much adverse comment in the aircraft industry.

THE 1932 AIR BUDGET.

(a) The French Air Budget just voted is for the nine months ending on December 31st, 1932. It has been voted at Frs. 1,826,511,707 (£14,706,000 at par). This is at the rate of £19,608,000 for twelve months, and represents an increase for that period of about £1,900,000 over the vote for the financial year which has just closed.

(b) The "credits d'engagements" or amount of orders which may be placed by the Air Department for material to be delivered during the 1933 financial year was voted at Frs. 739,000,000. This is an increase of Frs. 15,000,000 over the similar credits for the past twelve months.

(c) In addition to the sums voted in the Air Budget it is expected that the following amounts will be expended for air purposes during the next twelve months:—

	<i>Francs</i>
From the Frontier Defence Fund	100,000,000
From the National Development Fund	125,000,000
By the Ministry of Finance (Air Force pensions, not including war pensions)	100,000,000
By the Ministry of Posts and Telegraphs (for strategic telephone lines, etc.) about	50,000,000
Total	375,000,000
	= approximately £3,000,000

This sum is approximately equal to the amount expended for air purposes from sources other than the Air Budget during the past financial year.

The estimated total air expenditure of France (excluding sums raised by municipalities for municipal aerodromes) for the coming financial year will therefore be at the rate of approximately £22,608,000 for twelve months.

(d) It is worthy of note that at the end of the past financial year the

Air Ministry were so short of money that by a special law they obtained an advance of Frs. 100,000,000 out of the Budget which has just been voted.

(e) The Budget discussions in Parliament were limited to a few speeches by representatives of the various parties by arrangement with the Government. The object of the arrangement was to economize in time and enable the Government to pass the Budget quickly in view of the approaching general elections. Little of interest transpired during the debate.

UNITED STATES OF AMERICA.

LIGHTER-THAN-AIR.

U.S.S. "*Akron*."

In consequence of allegations that faulty workmanship and defective materials had been employed during the construction of the *Akron*, the Naval Affairs Committee of the House of Representatives, early in December last, decided to investigate these matters and appointed a committee for that purpose. During the course of the inquiry, the naval authorities admitted that the airship was slightly overweight and that her designed speed had not been attained on trials, but maintained that in every other respect the airship was perfectly airworthy. It was arranged that the committee should be given every opportunity to inspect the airship and to take a flight in her.

When being removed from the hangar on February 22nd to make this flight, the airship was caught by a heavy gust of wind, broadside on, and in consequence, after rising a few feet, bumped heavily on the ground, with some damage to the lower fin. The airship was returned to the hangar for repairs.

On February 25th the committee reported that, apart from the two failings admitted by the Navy Department, the airship was fully airworthy. (*Press extracts*.)

The airship *Akron* on May 10th-11th made its first flight to the West Coast of the United States. During the flight, owing to adverse conditions, an attempt was made to moor the airship at San Angelo, Texas. It is reported that the whole township was called out to render assistance, but the airship broke away and drifted some twenty miles southward before full control could be regained. The flight was then resumed.

On arrival at the base at Camp Kearney, near San Diego, California, another unsuccessful attempt to moor the airship led to the death of two of the ground personnel who were carried aloft on mooring lines and fell some 200 feet. A third member of the ground crew was hauled on board the airship after clinging to a line for some three hours.

The airship was later moored successfully, weather conditions having improved sufficiently. (*Press extracts*.)

U.S.S. "*Los Angeles*."

It is reported that the U.S.S. *Los Angeles* is to be placed out of service on June 30th next. This airship has been continuously in service since October, 1924, when it was flown direct from Friedrichshafen to Lakehurst, the U.S. naval air station.

It has been reported further that an offer has been made by com-

mercial interests to purchase the airship, and that the U.S. Navy Department is considering this offer with a view to devoting the proceeds to enlarging the new airship *Macon*, which is at present under construction. (*Press extracts.*)

HEAVIER-THAN-AIR.

Consolidated XP2Y-1 Flying Boat.

A new flying boat, built by the Consolidated Aircraft Corporation of Buffalo, N.Y., has been delivered to the U.S. Naval Air Service for test. This new boatplane is 60 feet in length, with a span of 100 feet. It is of sesquiplane type, and is equipped with three Wright "Cyclone" 575-h.p. air-cooled radial engines. All-metal construction has been employed, and it is stated that there will be developed a similar civil type, capable of carrying about forty-four passengers. (*Press extract.*)

GERMANY.

LIGHTER-THAN-AIR.

The Graf Zeppelin completed her fourth round trip of the year to Pernambuco, South America, on May 9th, 1932. A further six round trips are scheduled to take place between August and November of this year.

The completion of the flight ending on May 9th marks the twenty-first successful Transatlantic crossing of the Graf Zeppelin to date, these flights having been carried out as follows:—

- 1928 (1) October 11th-15th.—Friedrichshafen to Lakehurst.
- (2) October 29th-November 1st.—Lakehurst to Friedrichshafen.
- 1929 (3) August 1st-5th.—Friedrichshafen to Lakehurst.
- (4) August 7th-10th.—Lakehurst-Friedrichshafen.
- (5) September 1st-4th.—Lakehurst to Friedrichshafen (end of round-the-world flight).
- 1930 (6) May 20th-22nd.—Seville to Pernambuco.
- (7) June 3rd-5th.—Lakehurst to Seville.
- 1931 (8) August 29th-September 1st.—Friedrichshafen to Pernambuco.
- (9) September 4th-7th.—Pernambuco to Friedrichshafen.
- (10) September 18th-20th.—Friedrichshafen to Pernambuco.
- (11) September 25th-28th.—Pernambuco to Friedrichshafen.
- (12) October 17th-20th.—Friedrichshafen to Pernambuco.
- (13) October 24th-28th.—Pernambuco to Friedrichshafen.
- 1932 (14) March 21st-23rd.—Friedrichshafen to Pernambuco.
- (15) March 27th-29th.—Pernambuco to Friedrichshafen.
- (16) April 5th-7th.—Friedrichshafen to Pernambuco.
- (17) April 8th-13th.—Pernambuco to Friedrichshafen (this flight took over 100 hours, owing to heavy head winds).
- (18) April 17th-20th.—Friedrichshafen to Pernambuco.
- (19) April ?-27th.—Pernambuco to Friedrichshafen.
- (20) May 2nd-5th.—Friedrichshafen to Pernambuco.
- (21) May 6th-9th.—Pernambuco to Friedrichshafen.

JAPAN.

ENLISTMENT OF BOY AIRMEN IN THE JAPANESE ARMY AIR SERVICE.

It is reported in the Japanese Press that the military authorities are to introduce a system of enlistment for Boy Airmen. Entrance will be

by examination from among applicants who have completed primary school grade education. Courses as follows are to be held at the Army Air Service School at Tokorozawa:—

(a) *Pilots' Course*.—60 boys between 16 and 18 years of age.

(b) *Mechanics' Course*.—50 boys between 15 and 18 years of age.

A similar system is in operation in the Naval Air Service.

PRESENTATION OF AIRCRAFT TO THE MILITARY AUTHORITIES BY PRIVATE SUBSCRIPTION.

Press reports state that the Japanese public, stimulated by the Sino-Japanese troubles in Manchuria and Shanghai, are raising public subscriptions for the purchase of "Patriotic" aircraft for the Army.

There is a general movement in the principal towns throughout Japan with this object in view, and the number of these aircraft, either built or building, is said to number thirty, of which eight have already been presented.

ITALY.

NEW TYPES OF CIVIL AIRCRAFT.

Two new types of civil aircraft have recently been produced. One, the Savoia S.66, is a twin-hull monoplane flying boat fitted with three Fiat 500-h.p. engines, carrying fourteen passengers, with a cruising speed of 124 m.p.h. and a range of 745 miles.

The second, the Breda 32, is a low-wing monoplane of attractive design, fitted with three Pratt and Whitney Wasp Junior engines of 320-h.p. each, carrying fourteen passengers, with a cruising speed of 130 m.p.h. and a range of 838 miles. It is probable that the American engines will be replaced by engines of Italian manufacture when a suitable type has been produced.

Extracts from Articles appearing in the Foreign Press

EXTRACT FROM THE ITALIAN PRESS.

(*Rivista Aeronautica*, No. 12, December, 1931.)

THE INDEPENDENT AIR FORCE AND THE STRATEGICAL RECONNAISSANCE FORCES.

By MAJOR A. A. PIETRO MATTEI.

Numbers 3 and 9 of 1930, and Number 6 of 1931, of the *Rivista Aeronautica* contained articles on the characteristics of the various missions which may be required of and carried out by an Independent Air Force in the course of military operations.

A detailed examination was also made of the employment of fighters

and bombers, with the object of discovering how they should be equipped, and their crews trained.

This article is intended to complete the various themes developed in the preceding ones.

In the field of strategy and tactics, auxiliary missions are many and varied.

Those which appear to be of substantial importance from the two fundamental aspects of defence and offence will first be examined.

Defensive Action.—The two means of direct defence: the fighter and anti-aircraft artillery, have already been dealt with, and their work shown to be interdependent and directed by a system of observation and co-operation which must function rapidly and mathematically.

It has been shown how information relating to the enemy is obtained by observation and listening posts, equipped with modern scientific devices; the advantage has been shown of adopting very rapid means of communication between the various information posts, in order to forward the data collected in various localities to the centre as quickly as possible, so that its value may be estimated as a whole, and definite, clear and exact first-hand information given to the auxiliary and central defence commands.

It is well known that if a system of defence had no rapid and precise means of information, it could not even attempt to employ fighters, because it would end by dispatching its machines on hazardous, ill-defined missions, instead of against the enemy, so that the forces employed would be out of proportion to the object in view.

The fighter has generally to be employed within extremely short limits of time, when the minute seems to acquire a paradoxical value, so that it may sometimes decide the result of a whole defensive action.

The system of observation of the sky, referred to above, which only functions on the ground, must be completed by an air information and observation service. In defensive actions this last task must be assigned to the strategical reconnaissance forces, as the author will try to show.

Those who do not agree with the above will prefer to entrust the special auxiliary missions to fighter patrols flying over areas near the frontiers, or to day bombers with suitable range and equipment.

The author considers that both these ideas are subject to criticism for various reasons:—

If the fighter patrol on an observation mission has to attack an enemy formation, it will rarely be stronger than the adversary, since it is impossible for the command to know *beforehand* the number and type of the enemy machines; further, fighter aeroplanes can only accept battle if their range is sufficient at the moment in question.

On the other hand, if the fighter is ordered not to attack the enemy whilst on observation duty, it seems unreasonable to employ several aeroplanes for observation work which could be carried out by one two-seater aeroplane, which would be much freer to manœuvre. In this case also, therefore, there is a lack of proportion between the quantity and quality of the means, and the object.

Assuming that the fighter aeroplane is used only for observation, it is obvious that the results obtained would have to be rapidly transmitted to the ground by wireless. In addition, the enemy, once seen, will probably continue on its way, and the fighter patrol ought to follow it and report its movements.

Hence it may easily be deduced that the fighter will have to be equipped with a wireless set and sufficient fuel to allow it to remain several hours in the air.

Such requirements are a great contrast to the technical requirements already referred to for the fighter aeroplane in combat. (See "The Independent Air Force and the Fighter Air Forces," No. 9, *Rivista Aeronautica*, 1930.)

In addition, the employment of observation patrols multiplies the number of machines required, necessitating a total of forces, which increases, compared with the single aeroplane, in proportion to the number of machines in a single patrol. The resultant disadvantages are serious: reduction of the number of fighters ready for immediate employment, and increased use of personnel and material per unit.

The various considerations enumerated above seem sufficient to discourage the idea of using fighter aeroplanes or patrols for observation missions.

The employment of bomber aeroplanes for strategical observation is more reasonable, but does not otherwise fulfil all the necessary requirements: above all, the success of an isolated flight is doubtful, if such an aeroplane, without suitable means of defence, were attacked by a fighter: further, such machines lack manoeuvrability and speed.

Further, the bomber aeroplane cannot fulfil these last requirements, since it is designed to carry a given military load.

Above all, for reconnaissance work, it is slow compared with the fighter, against which it must defend itself, or which it must follow for a certain time, to report its direction.

On the other hand, no technical adaptation can sensibly increase the speed of a bomber aeroplane unless an improved type is brought out without the characteristics of the day bomber.

The fighter patrol and the day bomber cannot, therefore, be used for observation work, and a special type of aeroplane must be adopted; this will naturally be used without escort; it will have to follow formations of enemy aeroplanes, often of unknown speeds, perhaps for hours, and transmit the relevant information about them.

The first conclusions which may logically be drawn from an examination of its employment indicate, for this type of aeroplane, characteristics of high speed (superior, or at least similar, to those possessed by the swiftest enemy attacking machines), and technical equipment for the purposes of communication already referred to. In addition, as the necessary defensive precautions are not only taken over the frontier but also beyond the lines (and, above all, over enemy aerodromes, in order to observe the movements of the units), strategical reconnaissance aeroplanes must also have a wide range of action; whilst the necessity for careful observation and for defence of the aeroplane, even without automatic weapons, makes the employment of at least one observer advisable.

These first conclusions regarding material and the crew are confirmed in the section on offensive action.

Offensive Action.—The subject under examination especially concerns actions by day: this is because air observation at night appears unreasonable on the ground, and much more so in the air.

It is as well to bear in mind the fact that at night a part of what is shown on the map can be seen (and therefore what is common knowledge) and that a great deal can be masked.

The author refers to the artificial lights which the enemy can mask or displace, to suit his convenience and deceive the observer.

Observation at night with a view to seeking out the enemy in flight and finding out his route and objective then appears to be absolutely useless. These tasks can be entrusted to fighters in case of alarm, as they can give immediate battle.

The employment at night of the strategical reconnaissance forces should therefore be limited to photographing the light signals, which the enemy might use to guide his aeroplanes, and to photographing night air bases and collecting reports from other branches of the intelligence service.

Day actions, on the contrary, would seem to be the chief task of the strategical reconnaissance force: photographic reports; spread of gas and machine-gun fire on special military objectives; co-operation with the intelligence department; long-distance exploration and collection of information regarding enemy bases; propaganda work, dropping of manifestos, offensive raids for moral effect, isolated long-distance missions.

If periodical information as to the position, strength, and capacity of enemy camps is considered necessary, strategical reconnaissance aeroplanes will carry out the mission.

If it is necessary to attack a small enemy military centre at a great distance, a half-squadron of the S.R. is sent, armed with gas.

If propaganda work is likely detrimentally to affect the *morale* of the enemy, or a long-distance demonstration action is considered advisable, one or more aeroplanes will be ordered to fly 1,000 km. into enemy territory and drop a handful of manifestos or light bombs.

If it is necessary to carry out a long-distance surprise raid on landing stages, for example, or hidden dumps of inflammable substances, two, three or five very fast aeroplanes can execute the mission.

Crews unknown to fame who will never know the glory of conquering their adversary in air combat, but who have perfect machines, very fast and suitable, at their disposal, should make their way where they have a chance of shining; they know that the mission will be considered accomplished when the information, photographs, or passenger collected have been carried to a friendly base, and that this represents their first duty.

Generally, the missions must be carried out by *surprise* with forces varying from the single machine to the single squadron.

An escort will hardly ever be possible and will always be inadvisable for the obvious reasons of opportunity, freedom of action, economy of means, range, etc.

In order that these isolated actions shall have a good chance of success, it is not sufficient to trust in the excellence of the men or in surprise; it will be necessary to see that the aeroplanes have the required characteristics and armaments.

What weapon can be fitted on an S.R. aeroplane so that the crew can use it with advantage against a fighter aeroplane or patrol? And what weapon will disengage the S.R. aeroplane from air combat so that it can reach the objective which represents its principal task?

It is impossible to count on machine guns or small guns whose weight, amongst other things, would restrict the range; the author thinks that *speed* is the important thing. He insists once again on the

importance of speed (horizontal and climbing) in the employment of military aeroplanes.

Time does not count in aviation, according to the *standard* values marked by the mechanical pointer of the chronometer: time, in our war, does not only act as a regulator of the discipline of actions; it is, above all, an element of power which originates and develops special plans.

The author insists on the principle which gives a complete view of forces acting in time and space, revealing the signification of mass employment.

During the Great War, the "Serenissima" would never have reached Vienna, nor would Italian aeroplanes have carried out their renowned long-distance flights if the machines used had not had a high speed compared with their load.

Daring high-speed seaplane flights would have been foolhardy, had they not been undertaken with the idea of making it possible to increase the speed of series aeroplanes. If these increases are made from day to day, why should the practical results not be seen in everyday use—results which will vary with the speed, as they are dependent on it.

Is it possible to be content with 250 km./hr. and to consider machines of higher speeds than 300 km./hr. of little use, when aeroplanes with this performance are used to-day in the military air forces of various countries?

Why should it not be possible to manœuvre very fast machines in varied and profitable ways?

Whoever refuses to recognize these truths makes the same mistakes as those who, some ten years ago, considered certain manœuvres impossible with fighters as fast as the present C.R.

Why should the majority of pilots not be able to fly as correctly and well now or in the near future, in aeroplanes with a speed of 300, 350 or 400 km./hr.?

Captain Hawks has been able to manœuvre and land in a small space in a commercial aeroplane with this speed; so it will not be surprising if some pilots are allotted military types of aeroplanes with similar characteristics.

* * *

The special branch of the Independent Air Force which will have to employ faster machines (especially in horizontal flight) is without doubt the strategical reconnaissance, for the various reasons already given, which may be resumed, for the convenience of the reader, as follows:—

- Long-distance raids.
- Unescorted missions.
- Speed in the collection of information.
- Possibility of observing and following any enemy formation in flight.
- Possibility of withdrawing from air combat.

CONCLUSION.

The principal characteristics, which a strategical reconnaissance aeroplane should have, are as follows:—

- Range (more than 2,000 km.).
- Horizontal speed (about 350 km./hr.).
- Service ceiling (about 5,500 metres).

Two-seater.

Armaments (rear machine gun).

Photographic camera installation.

Wireless set.

Supplementary armaments (can be dismounted, or fitted according to the nature of the action); bomb-release gear for 2 kg., 1 kg. and $\frac{1}{2}$ kg. projectiles; device for spreading gas.

It is obvious that this type of aeroplane would be rather costly, difficult to pilot, and with a low factor of resistance compared with the high speed. It would need a pilot of high individual worth; and competent, trained observer officers will be required for its difficult tasks. Being an exceptional machine, it would require an exceptional pilot, but pilots are only made by long practice in flying.

EXTRACT FROM THE ITALIAN PRESS.

(*Rivista Aeronautica*, No. 12, December, 1931.)

THE EMPLOYMENT OF THE PARACHUTE IN WARS OF THE FUTURE.

By CAPTAIN A. A. PROSPERO FRERI.

There can no longer be any doubt that the parachute has attained a maximum degree of safety in use, in the Italian and other military air forces.

However, even if this safety device is sound and sure in normal air operations in time of peace, it certainly cannot be said to be so in time of war, at the critical and supreme moments when it is used in real combat: the parachute is not yet an instrument of war, because it lacks that speed of fall which is indispensable in escape from the rapid and sudden attacks of the victor.

What would become of a pilot who, after taking part in a battle at a high altitude (say 5,000 or 6,000 metres), jumps from his burning aeroplane with a parachute? Will he reach the ground, and probable safety, or because of the slow descent be caught by the fire of his adversary, and that of the enemy's guns and artillery?

The enemy pilot will undoubtedly follow all the phases of the fall of the aeroplane he has brought down; and noting his adversary's attempt to save himself by parachute, he will instinctively follow its slow descent, and determined to cut off every way of escape, aim at the body of the slowly falling parachute which offers an ample target; not from a spirit of revenge, but because of the considered reflection that, if the adversary were to land safely behind his own lines, he would soon be encountered again, a redoubtable enemy, at the front, so that it would not have been worth while bringing him down the first time.

The problem of the speed of descent is, then, of great interest; it would therefore be as well to investigate any solution which will in any way reduce, if not completely eliminate, the danger referred to above.

1. *Parachute with camouflaged body.*

One solution, or rather an expedient, which would not solve the problem of the speed of descent, but would tend to make it more difficult

for the adversary to get a constant aim at the target, is to make the body of the parachute of fabric, coloured inside and outside so that it will be less visible from the ground and from above.

It is obvious that the present parachutes of pure white silk are clearly visible from the ground and the air, even when the colouring of the sky is varied and uncertain. The body, as it is at present, constitutes too easy a target even from the point of view of colour, whilst, if it were sufficiently well camouflaged, the airmen might succeed in descending by parachute without being sighted by the enemy in spite of the slow descent.

2. Parachute with variable speed of descent controlled by the airmen.

A parachute fitted with a safety device, easily actuated by the airman during the descent, by which he could vary the normal speed of the parachute (about 5 metres/sec. at present) as required, to a speed of 20 or 25 metres/sec., would solve the problem fairly well. With this system, pursuit by the victor would be difficult, if not impossible, and the parachutist, reaching the maximum speed of fall at the moment of jumping off, will generally be able to reach safety before the enemy ground units can single him out and take action. In any case, he would run much less risk of being hit, as the greater the speed of a target the less easy it is to hit.

This system would also eliminate another disadvantage, namely, drift. This could be considerably reduced, if unfavourable, or increased if favourable to the return of the airman into his own lines, by changing the speed of descent, which will be regulated as required by the pilot.

3. Parachute with delayed opening.

The system of jumping off into space with the parachute closed is without a doubt the simplest and most practical.

A pilot, falling headlong with closed parachute after an emergency jump, is immediately lost to sight by his adversary, as it is not easy to follow from an aeroplane and aim at a target which is reduced to a point by the rapid speed of fall.

Apart from the effects of drift, when the parachute with delayed opening system opens, it has a good chance of evading enemy fire and reaching the ground in safety.

The author can guarantee that, in this respect, delayed opening is possible with modern parachutes fitted with appropriate shock-absorber devices, even for jumps from over 1,000 metres, without any detrimental results.

Certainly, before being able to make a jump of this kind, a certain degree of skill and assurance in controlling the parachute must be reached, but this is easily acquired by methodical practice.

4. Parachutes with body bearing national distinguishing marks.

This also, like the first of the proposed solutions, can effectively contribute to the pilot's chance of safety while he is at the mercy of the slow descent of the parachute and probable drift.

In fact, unless the descent, and therefore the landing, are made exactly between the two lines, there are only two possibilities: the airman will land either in his own, or in enemy territory; in the first case, the allied batteries and machine guns, warned by the national colours which are clearly shown on the parachute, will cease fire in the particular direction, and the parachutist will descend in peace; in the second case, the enemy, noticing the colours of the enemy nation, will desist from all attack,

considering it more useful and at the same time more humane to put the enemy and his parachute out of action at the same time on reaching the ground. In this way, any tragic consequence resulting from mistaken identification would be avoided.

In conclusion, it may be said that there are many methods, and that those indicated above could contribute, in a greater or lesser degree, to solving the problem of the safety of the airman when compelled, by the chance of battle, to rely on his parachute.

In any case, by accurate experiments and the institution of parachute schools, it would be possible to arrive at that practical and rational solution which will transform the parachute, until now of peace, into the parachute of war.

EXTRACT FROM THE ITALIAN PRESS.

(*Rivista Aeronautica*, No. 3, March, 1932.)

AIR OR ANTI-AIRCRAFT DEFENCE?

By LIEUTENANT-COLONEL A. A. MARIO FUCINI.

In a long article published in No. 1 of the periodical *Il Contraereo*,* Dott. Ing. Borsani examines the possibility of anti-aircraft defence as far as it concerns shelters for the population.

He was inspired by an article on the same subject in the *Rivista*†, by Capitano Medico Ferretti, demonstrating the effectiveness of shelters and the necessity for providing them without delay.

Engineer Borsani must certainly have studied the question in detail to be able to give us so much information and such a variety of arguments to prove his point.

His conclusion is that: "The problem of anti-aircraft protection, whilst not of the simplest, is certainly not insoluble, and the tasks it imposes, although heavy, are not such as to exhaust the economic resources of the country, which cannot be left without defence, dependent only on a theoretical conception of indirect defence, which has not yet been tested by experience."

He does not seem to have realized that there is a glaring contradiction in the last few lines.

"The theoretical conception of indirect defence (that is, by means of a counter-attack) has not yet been tested by experience. . . ."

If we are to judge by experience, the contrary is the case.

It was precisely the experience of war which suggested to the experts of the air defence question those ideas which, like the various refracted lights of a prism, unite in the white light of Douhet's statement. The Air Force can defend itself and the country solely by attacking the enemy Air Force and the enemy country.

This conception is not the result of calculations made at the desk of a theoretician who had only examples and statistics to go on. It is the result of logical reasoning based on the evidence of facts, and, if a

**Il Contraereo*—Air Screws and Engines. 12th January, 1931.

†*Rivista Aeronautica*—No. 12, December, 1931, page 481.

theory is required, a generalization drawn by common sense from the fact that the effectiveness of air attack is increasing, whereas that of passive defence is decreasing.

It was the war, that is, experience, which demonstrated how much the surgical work of a violent, general, and integral offensive action is preferable to the palliative of this passive resistance.

Even the armies had to leave the trenches and take the offensive if they wished to win. It was obvious that it would not suffice to exhaust the patience of the enemy, but that his every activity would have to be cut off by aggression.

In any case, if experience is lacking for the conception of indirect defence by attack, we should like to know what experience anyone has had of the other conception which should make passive defence so important a factor for victory.

Positive experience goes to show that when air raids became a serious affair, the towns were emptied, leaving little more than their walls exposed to the bombing aircraft; that, on the other hand, the means of passive defence then employed (and as effective against the raids of that time as they would be against those of the future) did not prevent the bombers taking aim at stations, arsenals, factories, and dumps—all objectives which got off lightly in the last war for the sole reason that aeroplanes could then almost be counted on the fingers, and that their offensive power only amounted to some tens of kilometres for some tens of kilograms of explosives.

The experience of the time also went to show that raids were no longer possible by day because of the fighter units, and that even at night they were frustrated time after time when bombing of enemy aerodromes was planned. Air warfare is so-called, because when it was defined it was referred to as war in the air or war between aircraft. This is the part which it is to play, and in order to convince oneself of it, it will suffice to observe solely and exactly what has been demonstrated by experience.

Engineer Borsani refers to the economic factor, advancing the theory that this might be an argument in favour of applying passive defence on a vaster scale than that at present proposed, asserting that the relative cost would be compensated by better results than those which would be obtained by *exaggerating* the conception of indirect defence. It would be interesting to know how he obtained the data for drawing a comparison of such a difficult nature, and what *experience* he used as a basis for it. But has he considered the *number* of towns which have to be defended? Has he considered that a defensive force employed in this way would be so split up as to be practically nil, even if huge resources were squandered on it, whereas this same force would retain its full value if it were employed as a solid mass of aircraft to attack the few but vital centres of activity of our most probable adversaries? Our opinion remains unchanged. It is clear that every country must know how to ward off enemy attacks by a rational preparation for passive defence, just as it is obvious that anyone taking part in a duel must know all the "parries." But we do not think we can be accused of being biased if we assert that the duellist cannot win if he does not know how to make a riposte and, above all, if he cannot attack.

Considering the aero-geographical position of Italy, we must conclude that it would be almost impossible for her to parry all the blows which

she might receive if she attempted to protect all her vital centres with adequate passive defence.

Even if she did employ all her resources to this end, she would gain nothing, for it would mean that the arm most adapted for defeating the enemy would not be used, hence the failure of the air power itself.

Material defences cannot serve to ward off enemy air attacks: the truth of this can be proved in the case of a nation which has a very limited number of objectives to defend. In Italy's case it is a very different affair, it is a question of moral defences which are to-day just beginning to appear in their full strength, and which will be formidable when the conviction of what an air force can do has penetrated into the minds of the people.

The important thing is that the people should be imbued with this elementary idea. This idea will give them the only strong defence: moral resistance, discipline. This, too, is passive defence, but very necessary against a kind of attack which cannot be materially neutralized to-day by any means, without the most violent consequences.

We cannot admit that the Italian people, who show the world the most perfect example of national discipline, should be treated like a crowd of fearful and ignorant children for whom it is necessary to anoint "the edge of the vessel with sweet liquor" in order to make them swallow the castor oil.

Only a Government which had to defend a population of persons unfit for war, or completely incapable and foolish, could decide to squander immense forces on the defence of such a people with the sole object of keeping them undisturbed, renouncing the idea of giving them the victory, or at least of a real defence by more logical and virile means: attack, reaction. Unfortunately we have said absolutely nothing new; but repetition seems to be necessary in order to combat opinions which in their turn are repetitions, and which really seemed obsolete long ago.

EXTRACT FROM THE ITALIAN PRESS.

(*Rivista Aeronautica*, No. 3, March, 1932.)

COMMENTS ON THE "MEMOIRS" OF BARON VON RICHTHOFEN.

By LIEUTENANT-COLONEL A. A. DOMENICO LOCATELLI.

The war impressions of the "Red Knight of Germany" ought to be read and thought over; they are without doubt interesting and instructive and may serve as a guide to the study and elaboration of tactics for the future.

The article on the memoirs in question, published in the *Rivista Aeronautica*, No. 9, of September, 1931, page 417, whilst in part expressing unquestionable truths, also expresses judgments and reaches conclusions which cannot be approved by all, since the Air Force has made surprising progress in a very short time, and it is now impossible to imagine actions carried out only by a few aeroplanes.

The author of the article especially calls the attention of the reader to certain opinions of the German ace on the importance of arms in air

combat, the responsibility of the pilot for their perfect working, and the great importance of the fighting spirit as opposed to stunt piloting. The conclusions of Richthofen, with which the author associates himself, make for the abolition of acrobatics at low altitudes, and emphasize the need for formations sufficiently open to avoid hampering the freedom of manœuvre of the commander.

"Doing this would not extinguish that 'adventurous spirit' flavoured with a pinch of unscrupulousness, erroneously considered necessary for fighters, for such a spirit expresses itself in a hundred different ways in the various phases of actual war training.

"Certainly the vanity of certain pilots and formation leaders would suffer; but this is evidently not of capital importance for the effects of such training.

"... So much the less do I see the necessity for trying them by theatrical nonsense, which can at most only excite the legitimate envy of the stage manager of Wagnerian opera, and this without taking into consideration the danger which these elbow-to-elbow formations present the whole time.

The author of the article concludes as follows: "... there is no chance of closed formations being employed, they are dangerous even when composed of expert, drilled pilots, and ought to be done away with, even if this provokes disappointment among the many pilots and those who are not pilots, who enjoy these shows.

"... from learning it (close order) for use in case of review, etc., to its adoption as a useful fighting arrangement is a long step.

"Here (as in individual acrobatics) it is a case of rigidly applying the motto 'Learn the art, and set it apart.'

"Many expert pilots, perfect at acrobatics, are useless in combat, because they lack that high, fighting, aggressive spirit with which fighter pilots must be endowed."

It is quite true that in the service training of fighter pilots in peacetime, one of the fundamental principles is a perfect knowledge of arms and their use; this knowledge enables the pilot to make a good use of the arms in question, by giving him greater sureness and speed of manœuvre, so that he can take full advantage of the ballistic and mechanical qualities of each.

It is equally true that rational and progressive gunnery training reduces to a minimum the causes of dispersion and makes the pilot acquire confidence in himself and his arms; it therefore promotes the aggressive spirit, as precision of aim increases in proportion to the ability of the gunner; hence the necessity for accurate and assiduous instruction.

Further, the writer is convinced that in the near future, individual instruction will be insufficient to meet the needs of a future war with all its possibilities and surprises. Massed training for firing in flight will be necessary, in order to acquire a complete knowledge of the limits imposed by the requirements of safety and manœuvre and the firing characteristics of the aeroplanes; this training will make clear to the sections concerned the development of the actions and their rational succession with a view to the material and moral disorganization of the enemy formations.

Audacity and an aggressive spirit in battle are natural subjective qualities; these moral forces can, it is true, be refined and developed during training, but remain qualities which cannot be considered objec-

tively. However, every generation has made its contribution of *real men* for the battle when the country needed it; the present generation and those to come will certainly not be inferior to those of the past; on the contrary, we may presume the contrary, when we consider the meticulous care spent by the National Government on the moral and physical education of the young.

The author of the article, therefore, in the writer's opinion, ought to have taken into account the preceding considerations, and before asserting that close formations are superfluous to the needs of war, should have considered the said formations not as an end in themselves, but as a means of individual and collective training for young pilots, as planned by those commanders who favour this form of training.

* * *

The writer is of opinion that a clear distinction should be made between training, which is the means, and employment in war, which is the end, and since in this case the end fully justifies the means, he insists that it would be as well, at first, to carry out the training by well-established methods and then investigate their use in war, deducing the resultant rules and principles.

Von Richthofen said, "It is certainly not a bad thing to be an artist pilot." The writer adds that it is, on the contrary, a good thing; the object of flying training, since it is not possible in peace-time to forge heroes for war, must doubtless be to make the young pilots "artists of air combat," that is, to bring them to that degree of technical instruction which it is most difficult to attain.

The fact that von Richthofen brought down his first twenty adversaries when flying was still a great difficulty for him teaches us nothing. The writer could contrast it with a personal experience of his own: he once said to a young pilot, to see what he would think, that an Italian war "ace" had brought down several aeroplanes before learning to turn right with ease. He answered with a smile that he admired the spirit and the courage of the "ace," but that it made him think that the enemy pilots who had been brought down must have been sent to the front before they had even learnt to turn left, much less right. .

In the air war of the future, the spirit of individuals will still be of great importance, even in massed actions, since air combat will be at close quarters, and pilots, although following their commanders, will also, under certain circumstances, be able to manœuvre on their own initiative.

The necessity for giving the pilot-machine-gunners a solid technical training and educating them in peace-time for air combat and massed flight, becomes evident; for endeavouring to bring them all to the same degree of skill in manœuvring the aeroplane and to instil into them that powerful moral force which generates the aggressive spirit, comradeship, tactical co-operation and flying discipline.

Training should concentrate on multiplying individual energies and uniting them in one powerful massed energy.

How is it possible to obtain this degree of war training for young pilots, in peace-time.

This is indicated by those commanders who have had the strength of mind not to consider close formations merely as useless theatrical displays, only useful in the preparation of flying displays.

It may seem paradoxical, but section experience proves that massed training, *in a short time and with economy of means*, forms pilots more skilled in individual and massed manœuvre, because it makes them lose the habit of continually observing the line of flight, and increases their sensitiveness. It accustoms the pilots to be quick, unconstrained and easy in manœuvre, intuitively obedient to the will of the commander; it develops the spirit of cohesion, co-operation, comradeship and flying discipline; it cultivates precision in manœuvres and the habit of estimating distances with regard to the other machines in the formation; and finally, it enables the pilots to keep position in the formations and during evolutions.

It is true that in flying displays the distances between machines are extremely small, but this is not by order of the commander, nor, in the writer's opinion, because of a "pinch of unscrupulousness" all round; this excessive nearness may perhaps be the consequence of human vanity on the part of the pilots themselves, who, although they know that in order to fly wing-to-wing extreme courage and accuracy of manœuvre are necessary, have a tendency to show off these qualities.

Close formations are certainly of little use and perhaps dangerous; the writer, however, considers that they should be allowed, so that flying training can be carried out by progressive and rational methods.

The writer could prove by facts that, in a brilliant Italian fighter regiment (*stormo*) during thousands of hours of flight in multiple formations with individual and massed acrobatics, the percentage of accidents to personnel and material was very much smaller than that of previous years, when the greater part of the flights in the same section were carried out individually.

"When, for example," the article continues, "one of the most brilliant officers of the service says, with an air of complete satisfaction: 'From the Commander to the last pilot, we can all loop the loop,' I ask myself whether my ideas on this subject ought not perhaps to be relegated to the attic."

Admitting that some stunts, perhaps including looping the loop, are no use in air combat, what moral and spiritual strength are shown by the words of this officer! Young Italian pilots are proud of their acrobatics and demand them, with reason, for their own personal satisfaction. Apart from considerations of war training, how can we subdue the bright flame of courage which inspires them, the sublime quality of the youths who have so often made our hearts beat with anxiety, enthusiasm and admiration?

The writer does not mean by this to attribute sovereign importance, in a lyrical manner, to the things of the spirit, but he is convinced that the fundamental factor of victory in modern combat, as it was perhaps of old, is the spirit, and he thinks it is necessary to exalt, not to depress it.

Acrobatics are a means of flying training which form the spirit of the pilot, exalt him and predispose him to fearlessness; they develop the aggressive spirit to the highest degree, spur on the pilot to act with determination, with rapid decision, and teach him calmly to sum up the most difficult situations.

Acrobatics are necessary, because they train the pilot to climb well, getting the best out of his machine; to make steady dives, as the author of the article says and wishes; to recover quickly, and manœuvre

accurately, in all directions and positions. They subject the pilot to a gradual and methodical series of flying exercises, which will automatically fit him for war manœuvres and give him an exact idea of the aerodynamic possibilities of the machine which he must use in air combat.

For acrobatics a particular spirit, and, above all, a physical aptitude not possessed by all, are necessary; indispensable qualities in the pilot of a fighter, who must know how to manœuvre his own machine, since it is very difficult to hit an aeroplane which is manœuvring with speed and decision (von Richthofen even says it is impossible).

One might almost say that acrobatics constitute an element of judgment and selection for young fighter pilots.

Massed acrobatics, supplementing individual efforts, much discussed and misunderstood, are the maximum expression of training in peacetime, that most suitable for enabling the pilot of a fighter to reach the highest degree of efficiency for employment in war.

It puts the fighter in a position to follow closely the most complicated manœuvres of the enemy aeroplane, to get his own machine into the most favourable position for attack, even when the adversary can also manœuvre well, and to keep it, whatever acrobatics the other may perform.

The flying acrobat has confidence in himself, which is everything in a pilot, especially in battle.

Massed acrobatics determine conditions of study and rules for fighting formations, inspired by true tactical principles, indispensable in a future war, in which, as has already been said, there will be no more isolated duels, no "aces" or "knights," but masses of more or less valorous air combatants, who will have to fall upon numerous, compact, and disciplined formations, which will develop intensive firing actions.

In order to obtain these results of war training, the writer considers it necessary to persevere in acrobatic exercises, in massed formations, as prescribed by the regulations governing the training and employment of fighter units. In the first stage of this training, the formations must not be too close, but tend gradually to become closer; in the second stage, when the pilots have become "artist airmen," the formations must be less open, and it will then be time to decide what distances, intervals and steps permit the simultaneous and collective action of the mass, without affecting the elasticity of the formation and the possibility of manœuvres by patrols or individuals (Regulations governing employment).

The writer is, in fact, convinced that close formations, acrobatic exercises and flying displays do not only serve the purpose of air propaganda or exhibitions, but tend to increase the moral and technical qualities of individuals to the advantage, even if it be only indirect, of training for war as a whole.

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BOOK REVIEWS

AN INTERNATIONAL AIR FORCE. By J. M. SPAIGHT, C.B.E., LL.D.
(Gale & Polden, Ltd., London. Price 5s.)

The proposals for an international air force must receive serious consideration to-day, because every nation desires security, and because the air arm undoubtedly is a suitable means of imposing, and also of maintaining, the law applying to all nations.

The well-known author of "Air Power and War Rights" devotes his lucid powers of analysis to an examination of the various proposals for the organization of an international air force, in this somewhat drawn-out book. He comes to the conclusion that "anything in the nature of a standing force is impracticable," but that a force composed of national contingents, on a *regional* basis, would meet the case to some extent, although the danger of default would not be eliminated. Dr. Spaight quotes what happened to an earlier peace-enforcing league, the German Bund in 1864-66, in which the system of peace-enforcing by contingents was reduced to an absurdity. He considers that this would not happen to-day if a definite and binding peace of mutual aid and support were given by the League States.

There appear to be two serious objections to the author's contention. First, the implication involved in such a system. The contracting parties would be permanently faced with the possibility of foreign entanglements in which they had no immediate concern. Secondly, the value of "a definite binding pledge." The qualities of institutions are due to the qualities of men's minds, and spiritual values are not the work of institutions. No amount of reading and education can transform the soul of a government. If its interests are threatened or an emergency is manifest, it is the national character which decides whether a pledge is binding. An intellectually conceived and recorded pledge merely remains a piece of paper. Something further is required at the back of any pledge of a League—"the big stick of the Law," which, where the nations are concerned, can only come from heaven.

This book contains valuable and stimulating material, particularly as the writer has that excellent habit of quoting the authority for the important facts on which his arguments are based.

A. R.

Book Notices

AVIATION AND THE AERODROME. By H. ANGLELY LEWIS-DALE. (Charles Griffin & Co., Ltd. Price 15s. net.)

This is a treatise on the problems of aviation in relation to the design and construction of aerodromes. The author is Assistant Director of Works, Air Ministry, and is also upon the Aerodromes Committee of the Royal Institute of British Architects. The book supplies a need among engineers, architects, town planners, municipal authorities, and others interested in the rapidly advancing problems of aviation and air transport in so far as these problems are related to the question of aerodrome construction and ground equipment.

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THE INFLUENCE OF GEOGRAPHY ON HISTORY: A LECTURE GIVEN TO THE UNITED SERVICE INSTITUTE OF OTTAWA

BY FLIGHT-LIEUTENANT C. C. WALKER, *Royal Canadian Air Force.*

HISTORY is the record of the past events which occurred during the long process of human development.

Primarily it is a concept of continuity and, like Time itself, which is a similar concept, has no beginning and no end.

The interpretation of the historical record is termed the philosophy of history, of which the better known interpretations are those of Buckle, Hegel and Marx, but unless the philosopher can correctly correlate the facts of history, his philosophy is apt to contain grievous errors.

The historian, when he offers us his account of events, is apt to convey the impression that man is the only factor to be considered. Therefore, according to the historian, when a leader fails it is because he must have been weak, wrong-headed or immoral; but if he wins he is endowed with all the virtues. When a general conquers his enemies he is something akin to the gods; when he later fails he must have decayed, degenerated or lost his wits.

This obsequious attitude of the historian is productive of much harm, which comes to light when nations confer together on great issues, because the only lesson the historian can offer is that man is not only the captain of his soul, but also master of his fate, and therefore if all men were "right-minded," there would be no more war.

In these days of economic depression it is obvious that man is held firmly by forces greater than his own—social, economic and biological—and I intend to try to show that geography has exerted an influence which has quite escaped the historian and against which man has been quite unable to prevail.

There are, for instance, immense areas in the world which have fallen a prey to the conqueror over and over again, but always after a few years we find these areas again independent.

Persia, for instance, has been conquered so often that it arouses the suspicion that any able soldier could overwhelm it, but it never remains conquered for long.

Greeks, Parthians, Turks, Arabs, Mongols and Afghans have

incorporated Persia in immense empires, but always it breaks away. Often it has broken away without much fighting—by its own inertia, so to speak.

The method of the historian in interpreting this strange fact is to write learnedly of Oriental luxury, sensuousness and other forms of what he considers degeneration. Feeling perhaps that this explanation is hardly satisfactory, he takes refuge in the assertion that "history repeats itself." This phrase alone shows how little we have been able to interpret the historical record.

To make this point clear, let us recall some historical coincidences. There have been two battles at Tannenberg, two naval engagements at Tsushima. Armies have marched through Belgium numerous times, and the Khyber Pass has seen armies descending on to the plains of India on many occasions.

Now if it be considered that human action is governed by factors other than its own desires, we must believe, in fact it is obvious, that these events occurred at these places on more than one occasion because of dominating circumstances which were similar in each case.

Armies, for instance, do not choose the Khyber Pass because soldiers are evil-minded or because they are pious, but because the mountains on each side of it give no other choice. The Germans in 1914 marched through Belgium because they could not invade France any other way. So instead of saying that "history repeats itself" what should be instantly obvious is that "similar conditions always produce the same result."

A parallel can be made between the flow of human development recorded by history, and the flow of water in a river.

Along the course of the river transverse ledges or sand-bars cause rapids or cataracts. We do not say each time we arrive at a cataract that "the river repeats itself," in fact such an expression would be an absurdity because it is obvious that similar conditions have produced the same result on each and every occasion.

If a chemist, every time he combined two atoms of hydrogen with one atom of oxygen to produce water, murmured that "chemistry repeats itself," the facts of chemistry could not be organized into a science to-day, but would be more in the condition of history, a mere set of isolated facts frequently interpreted into a pseudo-philosophy based on some very wrong assumptions.

If we look at any country throughout its history, we see that human conditions are always changing, for various reasons. Population increases, economic situations alter, and so on, but the one factor which remains constant is geography. It can be objected that man has made enormous progress in late years and that conditions have so changed that we can discount geography to a great extent. This

is true, and I shall deal with the point later, but, generally speaking, the same geographical problems which faced our ancestors face us.

Let us take some examples from military history. Some thirty-seven hundred to four thousand years ago, in about 1800 B.C., ancient Egypt was conquered by a people called the Hyksos, or Shepherd Kings. When these Hyksos were eventually driven out, they crossed the Sinai desert and occupied what is now Palestine and Syria, thus presenting the Egyptians with the problem of defending their country from attack from the north. The Egyptians had two choices before them, either to defend the Egyptian side of the Sinai desert, or to cross it and make Palestine a buffer against their foes. The policy they adopted four thousand years ago was identical with the policy Allenby adopted in 1917 when faced with a similar problem. Similar conditions produced the same result.

Once across the desert the ancient Egyptian, like the modern British soldier had to push on, geography gave him no choice, and so the Egyptian empire eventually included all the Mediterranean coast to the base of the Taurus mountains.

Again, about 700 B.C., Assyria conquered all the land we now call Irak, or Mesopotamia. After the conquest her administrative difficulties were increased by three centres of resistance, one in the marshes near the coast, and one in the mountains. A desert problem with its raiders was also in existence. Great Britain conquered Mesopotamia in 1914-18, and immediately was faced with these three problems, one in the marshes, one in the mountains, and one in the desert. It is interesting to know that just as the Arab raider from the deserts goes back to the days of earliest civilization in Babylonia, so the Kurd in his mountains was a thorn in the side of the Assyrian before 1000 B.C.

If we examine actual military operations the facts are more marked still. When studying the campaigns of Jenghiz Khan against the Empire of Khwarazm, I found that most of the places of importance in his campaigns were mentioned in the campaign of Alexander the Great, 1,500 years before.

The armies of these two great soldiers marched across Western Asia for many years, and for hundreds, if not thousands of miles, the Mongol armies trod in the footsteps of the Macedonian. They swam the same rivers in the same places, captured the same fortresses, starved in the same desert, camped in the same oasis and divided their forces in the same districts. It was not because each commander was a genius, but because under the geographical conditions they could not do anything else.

Reverting back to Egypt and the Sinai desert. If we refer to a large-scale map we note that the Sinai desert connects with the Arabian

peninsula *via* a route from Akabah; but there is no definite record in 5,000 years of an invasion made by way of Akabah, so far as I have been able to discover. Always invasion from the east has first required a base in the north, in Palestine or Syria. When Islam entered on its career of conquest in the 7th century, it commenced from Mecca and Medina, but although we might think that the desert camel-men would have no difficulty in crossing this short strip *via* Akabah, yet we find that they came by way of Syria and Palestine. Stranger still, when Great Britain sent her army to Egypt in the middle of last century she did not land at Aboukir or Alexandria, as sea-power should require, but went up the canal to Ismailia and then turned west.

The reason why I have gone back so far in history is in order to present as much data as possible for the conclusions which I will give. What I am trying to do is to show that, given certain geographical conditions, certain results ensue. If we only had to depend on the history of, say, Canada, it would be just as though a geologist, trying to obtain data in a country new to him in order to form correct conclusions, merely contented himself with looking at the surface of a ploughed field, or sinking a bore-hole to about fifty feet. For most of Canada our record goes back little more than fifty or a hundred years. To quote Canada as evidence might be just as erroneous, as for a geologist who, finding a granite boulder in a field, assumes that the formation beneath must be granite, when, if he cared to dig down more deeply, he might have discovered a much more recent rock, because the granite boulder could have been carried to the spot by glacial ice.

So, in order to form a solid basis to work on, I am doing what the geologist does when he examines the results from many bore-holes which go down five or six thousand feet. After arranging and collating all the information he can obtain, when he sees a certain formation on the surface he can state with a fair amount of certainty what can be expected underneath. He can generalize, systemize, and tell what to expect.

From a military point of view what I have implied regarding the importance of the geographical factor in each and every one of the instances I have given must appear fairly obvious; but the reason why I have stressed them is because you will not find any stress laid on the geographical factor in general histories. The first chapter of a historical work may be devoted to a description of the general geography, but the bulk of written history ignores the geographical factor entirely.

If you compare the length of the history of Egypt with the length of England's history or with that of any other European history, you will see that the history of Europe has only just commenced.

Now, if we get down to the fundamentals of a nation's existence, the vital factor of security is all-important, for without security a nation would not exist for long. If, then, we glance at a map of Egypt we see why it is that Egypt has had such a long life. Surrounded on all sides by impassable deserts, with a marshy and swampy area on its sea coast, this long strip, hundreds of miles long and two to five miles wide, with its most unmilitary people, has watched military empires rise and fall. Its cities have never been fortified against land attack, and it is seldom that a military enthusiasm has been aroused. In the first millennium B.C. it preferred to pay Greeks to do its fighting, and later it depended on captured slaves, called Mamelukes, so peaceful has its population been, and yet we find it continuing on as a people and a nation.

There is no other alternative before us, but to place this long life on the security which geography has given her. The Egyptian has changed his rulers quite a few times, he has changed his religion and his gods, he is speaking to-day in a tongue that would be foreign to his ancestors, but he is essentially the direct descendant of the Egyptian of five thousand years ago. There is another people close by, the Arabs, of whom the same can be said. Unlike the Egyptian he has been a warrior and a raider of the agriculturists on his borders since the earliest days of civilization; but the Arab of to-day is the descendant of the Arab of five thousand years ago and his breed has never been supplanted. Arabia has never been effectively conquered and occupied by foreign powers, and the Turkish hold on Arabia was precarious in the extreme. The cause of this security is obvious when we look at the geographical barriers.

Japan has the oldest dynasty in the world—would we be wrong in attributing this in great part to the geographical security she possesses?

From such arguments I can only offer the deduction that the real basis of the security of a people is not its army, or navy or air force, but geography. Its fighting services only augment and strengthen the barriers which geography erects against its neighbours.

Let us apply this rule further. It is said of many peoples that they have no history. If we look at the great continent of Africa we can say most of it has no history. There are no great homogeneous areas surrounded by secure frontiers, in which a people could exist for long periods, through most of Africa. The two areas of it which have a history, and extremely long ones, are the two areas which nature has made most secure, Egypt and Abyssinia. Ancient Carthage depended on the sea for her security on the northward side, but, compared with a desert, the sea is an unstable barrier, because it needs a navy to hold it. When the Roman navy rose to the

occasion Carthage was finished as an independent state. If we look at America we see precisely the same thing. Until the coming of the white man most of America had no history, that is to say, its peoples had no continuity of secure existence; but there were two areas, in Mexico and Peru, around which geography had erected most effective barriers, which therefore had a long history. Over the rest of the continents of America and Africa there were no areas where the geographical barriers gave real security, so that continuity of existence was impossible, and although the inhabitants were certainly warlike they wandered about, fought with their fellow tribesmen, and merged with their neighbours or were exterminated. There was nothing to stop them.

If we look at the map of Europe, we see that the law holds true. We see England, for instance, surviving as a separate nation when most of the rest of Europe was conquered by Napoleon. Because of the absence of sufficient geographical barriers, we see Wales and Scotland merged with England, but Ireland, only separated from them by a few miles of sea, still a land apart. Is it too much to assert that it is this small body of water, the Irish Sea, which is chiefly responsible for the prevention of unity between Ireland and Great Britain, and that the Irish Sea has also nullified the work of the ablest British statesmen, and soldiers without number? It has not prevented Ireland being conquered, but it has prevented absorption and real unity with Great Britain.

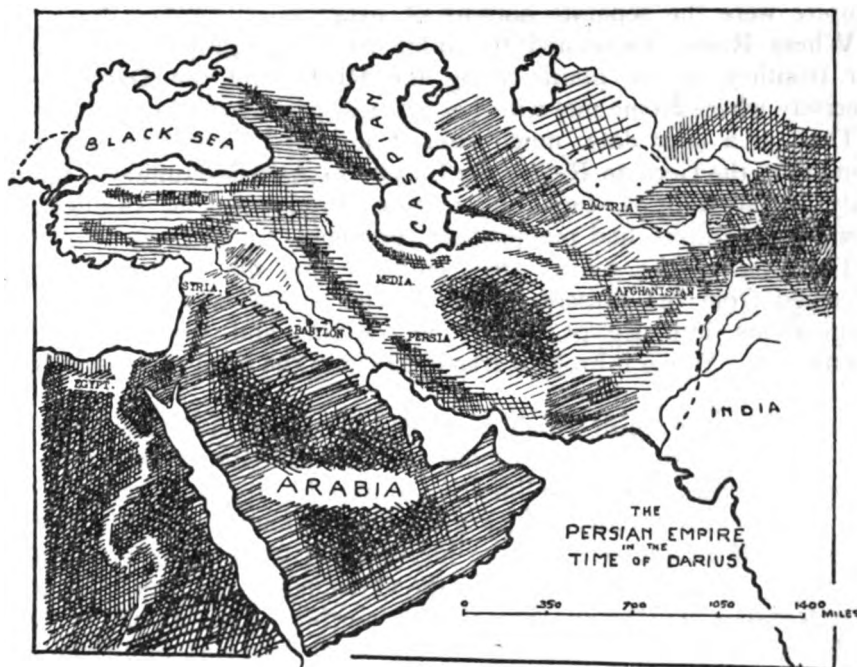
If what I have said about geography being a people's security, so that it is enabled to continue as a separate entity, is scientifically correct, then at once the other side of the argument comes to the fore. What happens when two peoples live with a common frontier which is not sufficiently pronounced geographically to constitute a solid military barrier between them?

If we look back a mere matter of a hundred years or so, and examine a map of Italy or Germany, as they were then, we do not see these areas occupied by a united people but by many small states, and none of them separated from one another by geographical features worthy of the name. If we go back a few more centuries, we see Great Britain divided into the three kingdoms of Scotland, England and Wales.

We see Russia divided into an immense number of states or principalities, France divided into a number of semi-independent feudal dukedoms, of which Froisart wrote a long tale of incessant fighting. We see those areas torn by frequent war, just as Arabia, for instance, is to-day. Then suddenly we see those European areas unified and united socially into major entities, but this time with more or less well-defined boundaries, and at once the incessant internal warfare ceases.

From the great number of instances of this which are available let us then deduce another law, which I will call the Second Law of History. Whenever a well-defined geographical entity has existed, without being divided up by well-marked physical obstacles, sooner or later a well-defined social entity has come into being.

If we desire another example, we can examine the map of India. Before the British came, India, during the past 3,000 years, had been



The darker the shading, the more pronounced the geographical and physical obstacles.

the seat of mighty empires; but owing to various reasons, of which geographical distance alone was the chief, it split up and divided. The British found it a mass of small states or principalities all fighting with their neighbours, while to-day the geographical entity is organized as a social entity—and the internal warfare has gone.

Speaking of empires, we are forced to look at the geographical situation from yet another angle. It may happen that a great soldier may take his army beyond his country's geographical boundaries, and absorb some other nation into his empire. The result is a state of affairs where geography splits up and divides a social entity, i.e., an empire, into many homogeneous geographical areas.

Then sooner or later we always find that the social entity has split up and subdivided into its geographical divisions.

Now before I go any further, let me say that the time factor does not enter into the situation. All that we find in history is that, given these conditions, the results are certain, but we cannot place a time-limit on their action.

If we examine a map of the ancient Roman Empire of, say, 150 A.D., with the geographical obstacles plainly marked, we find a good example of this Second Law. The homogeneous geographical divisions of that Empire were the separate nations of 1914.

Where Rome discounted the influence of geography by placing her frontiers in the plains along the Rhine and the Danube was precisely where Rome met with her greatest problems at a later period.

Then at a later date, much later if judged by common historical standards, the German Reich, the Empire of Austria-Hungary, Spain, Italy, social entities, each under its own government, fulfilled the destiny geography had mapped out for them.

The first of the really great empires was the Assyrian, which stretched from the present Mosul district across most difficult communications into Egypt, Babylonia, Syria, and into the Taurus mountains. When it broke it fractured along the lines of geographical division.

The Persian Empire which succeeded it covered a larger area, and was later taken over by Alexander and his successors, and again the lines of its fracture were the lines of geographical demarcation.

In the twelfth century A.D. a great empire known as Kara Khitay placed itself astride some of the highest and most difficult mountain ranges in the world. It ran from the Oxus across the deserts of what was Russian Turkestan, across the northern mountains to Lake Balkash, thence astride the ranges of Central Asia into Sungaria, and then south into Chinese Turkestan, with its capital at Kashgar.

When we realize that the immense ranges which split it up are almost, if not quite, impassable for six months in the year, we can see that such a social entity was doomed to destruction. It lasted about 100 years.

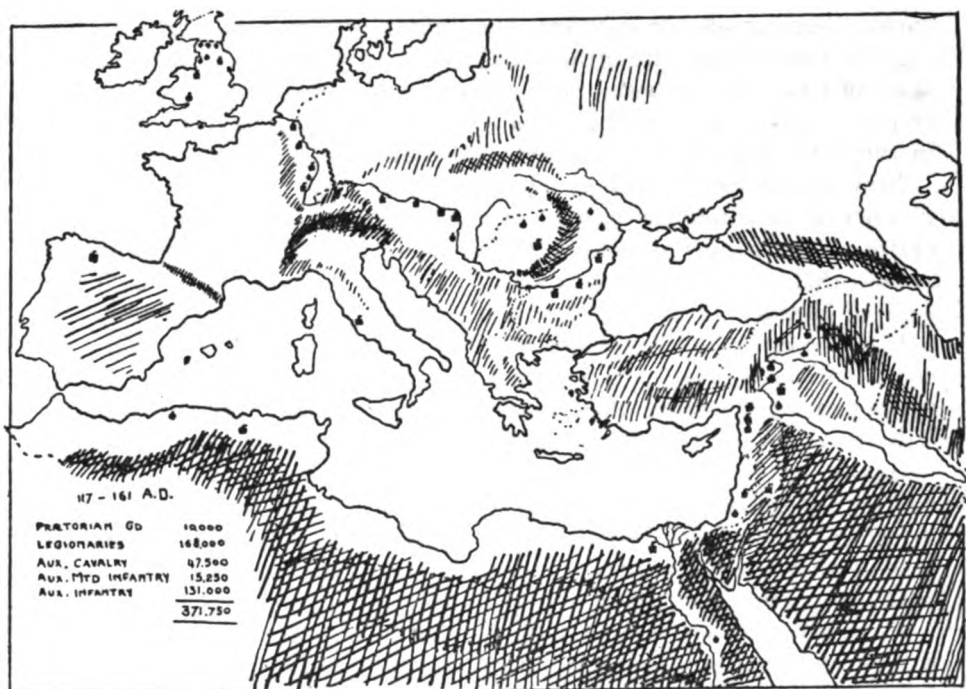
The Tartar Empire stretched from the China coast to the forests and swamps of the Baltic littoral.

To the inertia of distance alone was added geographical obstacles in the shape of seas, mountains and deserts, and it splintered into fragments within a century, not because of wars or revolts but because of its own geographical inertia—the inertia of mere distance, and again the lines of fracture were the lines of pronounced geographical demarcation.

Timur's empire, which included Syria and Armenia in the west,

Eastern Russia, all Persia, Transoxiana, and India as far as Delhi, fell to pieces on his death. Man could conquer, but man could not hold together in face of the tremendous geographical obstacles, because the inertia of geography is greater than the activity of man.

Napoleon's empire bears out the rule. He could conquer it, but he could not hold it. Man may lay the basis for social entity by



Sketch map of the Roman Empire about 150 A.D. with the military concentrations indicated. The concentration is greatest where the physical obstacles are weakest.

founding an empire; but if geography splits that empire man will not hold it for long, and in face of all the evidence available it is no use blaming man for his inability to counter the silent but ceaseless pressure of geography.

The British Empire is in many ways geographically unique. Whereas the farthest borders of a land empire are normally the parts which are most vulnerable, the main core of the British Empire's strength—that is England—has usually been nearest to its foes, but England has been given security by the sea.

Whereas Napoleon was weakened by blows struck far from the core

of his strength, in Spain and in Russia, it has seldom been possible for an enemy to attack the weaker portions of the British Empire without first having to encounter her main strength. When attacked in outlying areas, such as the American Colonies, the British Empire suffered a severe loss. It has been the strength of the Empire that the "key to India lies not in the Khyber but in London."

Actually, the British Empire has never really undergone the test to which other empires have been subjected. She has not yet seen an enemy lopping off her outlying Dominions or Colonies before attacking the core of her strength. If there is anything to be read in the story of past empires based on the sea, it was their brittleness. A land empire could survive, like Russia in her war with Japan, when beaten in the field, but not sea empires with their navies gone.

Now if this generalization which I have called the Second Law of History is scientifically correct, that is to say, where a geographical entity exists, sooner or later a social entity comes into being, then it follows that the opposite must also be true. We can call it the Third Law of History.

If a homogeneous *geographical* area is divided into more than one social entity, so that each separate state or nation has its boundaries resting on open plains, then sooner or later we find that the stronger will attempt to absorb the weaker in an attempt to remove a source of insecurity or instability. If it is unable to succeed, we find either a continuous period of warfare or a feeling of instability with constant threats of war along that frontier. Because the Treaty of Versailles disregarded this is one reason for viewing the future peace of the world with the gravest concern.

From what I have said previously, that it is geography which gives a state its security, it follows that every nation sooner or later attempts to expand until it can place its frontiers on solid geographical obstacles.

If we look at Russia we see this result. After she had removed the Tartar menace in the sixteenth century—there was no barrier to prevent her doing so—she expanded across the grassy plains eastwards until she reached the barriers of the Caspian Sea and the Urals. Between these two geographical features is a strip of open country as wide as the eastern frontier of France, and almost unaware of the fact Russia slipped through into the steppes beyond because there was nothing except a few bands of nomadic horsemen to stop her. Once through there was nothing for it but to go on. It was not a question of desire but a necessity—she could not halt on an open steppe. There was a long delay in the Lake Baikal region—if we glance at a contoured map we can appreciate why—and next we find her on the Amur and even in Alaska.

Southwards she kept on until she was halted by the desert-steppe

bordering the Aral Sea, but as this was no real barrier she pushed on until she was halted by the mountains of Khorassan and Afghanistan. Eastwards the mountains of Central Asia are a very real geographical barrier, and for the present at any rate Russia has halted. In Europe, when opportunity offered, she stepped across the frontiers of Poland and Finland : there was nothing to stop her.

If we look at India we see the same conditions producing the same result. First, the British settlements on the coasts, with no real security from geography, and then a definite movement towards placing the frontiers on solid geographical foundations. It was either that or a condition of continued instability and insecurity which would have tended towards extinction.

Let us go back to the Roman Empire. First we see Rome as a little city state, then on account of the open plains around her we see her absorbing—by conquest—the neighbouring tribes until at last she made the Alps her boundary. But owing to the fact that the Alpine passes could be crossed by Gauls and other marauding peoples, Rome crossed the Alps into southern Gaul. There was no frontier here, so she pushed on to the Rhine. This search for a secure frontier is the whole story of Rome's expansion, and her foreign policy consisted in the simple principle that she felt it her duty to control any possible threat to herself and the peoples she made subject ; in other words, it was a quest of security. But it is an unfortunate fact which has carried with it severe consequences throughout all Europe's history, that there is not a solid geographical barrier on the Continent of Europe. Italy is perhaps the best example in Europe of a homogeneous geographical area, but the Alps, unfortunately, have their steeper face towards Italy. Therefore, over long stretches of frontier, Rome erected walls and palisades, but it is geography, not walls, on which security must be based.

In the history of the Roman Empire, we see in operation all those principles which I have enumerated as the Laws of History.

1. The security of a State rests on its geography.
2. Whenever a well-defined geographical entity has existed sooner or later a well-defined social entity has come into existence.
3. If two or more peoples have their boundaries on a weak frontier, we find that the stronger attempts to absorb the weaker in order to attempt to remove a source of insecurity, or else we find almost continuous difficulties on that frontier.
4. When geography splits up a social entity such as an empire into more than one homogeneous geographical area, sooner or later the social entity has split up and subdivided in order to conform to the geographical areas.

I have described various empires of the past, and if we examine

their extent, their geographical divisions, and their eventual disintegration it becomes obvious how true my Fourth Law has been. There are two recent examples of it.

Burma is geographically divided from India by the difficult country to the north of the Bay of Bengal. Only yesterday, so to speak, Burma broke away from India in a political sense.

Again, Manchuria is linked with China by a very tenuous line of communications and, geographically, is not part of China, so Manchuria has followed the path set out for it by geography.

True, Manchuria has conquered China more than once, but on each occasion China was not made an appendage of Manchuria, for the invaders settled in China, leaving Manchuria as the appendage of China.

Much has been written by philosophical historians, attempting to interpret the facts of Roman history, on the unsoundness or rottenness of the heart of Imperial Rome. If they would but look at the utter unsoundness of the northern frontier, based only on rivers, with hardly a stretch of solid geographical obstacle for over a thousand miles, they would be much nearer the truth of the matter. Let us take a few figures.

In the first century, A.D., Augustus required 250,000 men under arms to defend the frontiers, but was forced to reduce the number owing to the strain on the exchequer.

By the middle of the second century, although there has been very little expansion, 370,000 men were required.

One hundred and fifty years later we find that Diocletian required one million men.

If 250,000 were a financial strain what must have been the result of maintaining one million?

India at present may or may not be heavily taxed—but I would ask you to try to imagine the internal condition which would result if India's defensive problem required her to maintain an army just four times the size of what it is to-day.

Then, if the future historian of India went only to the Congress native press for his facts, I think we would have a history of the decline and fall of the Indian Empire not very unlike Gibbon's magnificent work, with all the blame placed on mental, moral, and physical degeneration, or something of that nature.

To place the blame on the heart for a general collapse when the extremities are overworked is absurd. The strain on the Government of Imperial Rome was simply due to over-exertion on the frontiers and it is a symbol of Rome's greatness that she held that weak river-line for over three centuries. The strain of it killed her in the end, but let us place the blame squarely where it belongs and

not indulge in solemn and dignified gossip about sensuality at court and immorality in high society.

Again, if it is geography which gives a nation its security, then it follows that the less difficult the geographical barriers the greater must be the commitments on the military services.

Let us take a hypothetical case. Suppose you have a nation surrounded by a Himalaya Range on every side but one. Let us suppose that gap in the geography is two hundred miles long. Over on the other side of that gap is a nation which has all its other borders on very weak boundaries but with strong neighbours beyond them. In order for the second nation to guard its weak borders, it requires a very strong army. Nation number one sees that its gap constitutes a danger when there is a strong army on the other side, and it must therefore increase the size of its own army because of the strong army possessed by number two.

Have we not in this hypothetical case, the problem which every disarmament advocate has to face? The crux of the whole business is not the strength of number one's army but the weakness of number two's frontiers, and when the frontier is so weak that it must be defended by armies, what is one nation's security is the other's insecurity.

What then becomes of that ideal of statesmanship—the principle of self-determination? It is a splendid ideal, but statesmen are "striving with the gods" when they ignore geography.

I mentioned the Himalaya mountains. Only twice in history, so far as I can ascertain, has that chain been pierced by armies, once when a mixed force of Chinese and Tibetans came through in 1792, and once when a British force advanced into Tibet in 1904.

If each nation in Europe was surrounded by a Himalaya Range there would be no need for armaments on the present scale. There would be few wars—they could not get at one another. Unfortunately, the geographical boundaries of European States have never been good ones, and so we find that war in Europe is of frequent occurrence and usually it develops into a general conflict. Incidentally the Treaty of Versailles, by breaking up social entities occupying homogeneous areas, and placing many boundaries on open plains, attempted to discount the historical truths which I have enunciated.

Earlier on in the beginning of my lecture I indicated that I would refer to changes in conditions that have occurred in late years, which apparently upset the truth of my arguments regarding the influence of geography in the past.

Throughout the previous part of this paper, whenever I referred to instances which have occurred in past history, most of you were probably thinking of similar conditions which exist at the present

day. It must be obvious that many of the generalizations which I have given must undergo modification, not because they do not apply, but because geography, in so far as it gives security to a nation, has undergone changes.

The boundaries of Canada, for instance, have definitely undergone physical changes. If we look back a matter of a hundred years and read the account of Arnold's march to Quebec, I think it is clear that Canada owed her independence to geography. But to-day an enormous change has occurred in that area. The forests which caused Arnold's men such terrible hardship have been felled and the rivers and streams have been bridged. It would be true to say that Arnold's exploit could be duplicated now in as many days as he took months, and in comparative comfort. When we recall that United Empire Loyalists moving towards Ontario from Philadelphia took months to cross through the forests of Pennsylvania and New York State, I think we can say that geography has altered.

The barriers of the north-east frontier of France remain, in their physical features, practically what they were in Cæsar's day. The forests might be thinner, and the marshes of the lower Rhine have been drained, yet the Ardennes, the Vosges, and the Jura remain much as they were. In so far as they constitute military obstacles they leave much to be desired, as Rome found out. She pushed on to the Rhine, but though a river might be an obstacle to the savages who inhabited Germany in Rome's day, it is certainly no barrier to a modern army.

Modern communications have so far developed that the railroad and the highway make it possible not only to cross most European frontiers but to maintain far larger armies across them than would have been possible a hundred years ago. These means of inter-communication have really lessened the value of geographical barriers and military obstacles in so far as security is concerned. Recently, also, a new method of transportation has come into existence. Aircraft, for all we know, may only be in an embryo state at the present day; but they are able to nullify many of the old military obstacles. It follows that even where the physical geographical features have not changed, yet their value as a means of security has lessened. Right through Europe to-day the geographical barriers are going down before modern developments, and the effect is obvious in the uneasiness we see so clearly displayed at Disarmament Conferences.

Another point which I must mention is the defensive power of modern fire-arms. We know how the hillmen of Afghanistan and the North-west Frontier have been able to hold off the British armies to-day. It was not so in the old days. Afghanistan has only been independent of Persia for a comparatively short period.

Alexander the Great and other conquerors appear to have had very little trouble with the hillmen in ancient times. When a valley is only a few hundred yards wide one man with a rifle who sits on top of a hill can effectively block the passage of ten men, whereas in Alexander's day he had to come down from his fastnesses to hold a defile.

It is this modern facility of communication which makes possible such empires as Russia or India to-day.

Russia succeeds where the Mongol failed; India holds where the empire of Akbah disintegrated.

Previous attempts to retain control over such vast areas broke down from causes connected with mere distance alone: it is the cause of the breakdown of unity in China to-day, and on many other occasions when China has dissolved into chaos. Where it might have taken weeks or months for an official to cover his area on a tour of inspection a few generations ago, to-day he can do it by rail or motor, or even by aircraft, in a few days. The news of a rebellion in India would probably have taken a month to reach Babylon in the time of Darius; to-day the telegraph tells Baghdad of the event in a few hours, and the day after aircraft can be landing on the scene.

I would mention here that one explanation given for the collapse of the Persian Empire of Darius was because it was divided up into satrapies.

Similarly the breakdown of China is with equal facility attributed to the powers of provincial governors. But the problem goes much deeper.

The Persian Satrap and the Chinese war lords owed their power to geography, because the Central Government could not possibly centralize every detail of administration in its own hands.

It is surprising that such philosophers do not advocate that the Dominion and Colonial administrations of the British Empire should be centred in London. Rome attempted to centralize all administration in her Republican days, and it nearly ruined her.

If we look at the distances alone, we see another influence which geography can impose on such an enormous extent of territory as the Russian Empire. A plain may not be a geographical obstacle for a short distance, but when it stretches thousands of miles it certainly presented problems to the administrator at one end who desired to communicate with a subject at the other end. To-day the telephone, telegraph, and wireless have eliminated many such administrative problems.

We must agree with General Smuts, when he asserted that the globe has shrunk, that present means of communication have shortened distances and geographical obstacles have been removed. Then what

of the future? That is not my province, which deals only with the past.

One more point before I close. If you pick up the average history book and read about the fall of Rome or the fall of any ancient empire, you will see references to the luxury, the moral degeneration, and general wickedness to ministers, kings and emperors. The historian, dealing as he does with morals, kings, art, architecture, and everything human, forgets that the human animal must live on the ground, and that therefore the ground around him is very important. He deals so much with the minutiae of events that he fails to see the mountains on the frontiers for the molehills of his own creating. Even when a map is published in a historical work, it is seldom that it has the contours marked.

Gradually a more liberal viewpoint is coming into the historian's attitude, and he realizes now that in giving over-much credence to many of his authorities he is apt to be as far wrong as though a future historian of England limited himself for his authorities only to newspapers published by Communists or to the more brilliantly yellow brand.

I strongly recommend that whenever you are reading a history of ancient times, and find references to the extinction of a country or the break-up of an empire being due to moral laxity, moral degeneration, Oriental luxury, or some other human attribute, you put down the history book and pick up a contoured map and see if the influence of geography has not had much more to do with the event.

What I have tried to show is that there are factors in history over which we, as human beings, have no control whatsoever, and that in all his struggles of the past man was in the grip of forces far more powerful than his own efforts.

So far as human effort is concerned, we are as helpless before these geographical influences as we are against a volcano. Philosophical statesmen can, if they like, accede to the principle of self-determination when a people insists on living in the crater of an active volcano, and we know what the result will be; and when statesmen accede to the same principle of self-determination, and draw up a Treaty of Versailles, ignoring the geographical influences against which human effort is helpless, they are doing the same thing. Let us also remember that when the social scheme of things has to reorganize and adjust itself to conform with the silent but ceaseless pressure of geography, it normally means *war*. Man can "strive with the gods," if he likes, but we always find that the gods retort by making man strive with man. It is to the credit of British statesmanship that a country like Burma can break away from India without a disastrous war.

If we look at the fate of all the great empires, from that of Cyrus to

METEOROLOGICAL PHOTOGRAPHY.

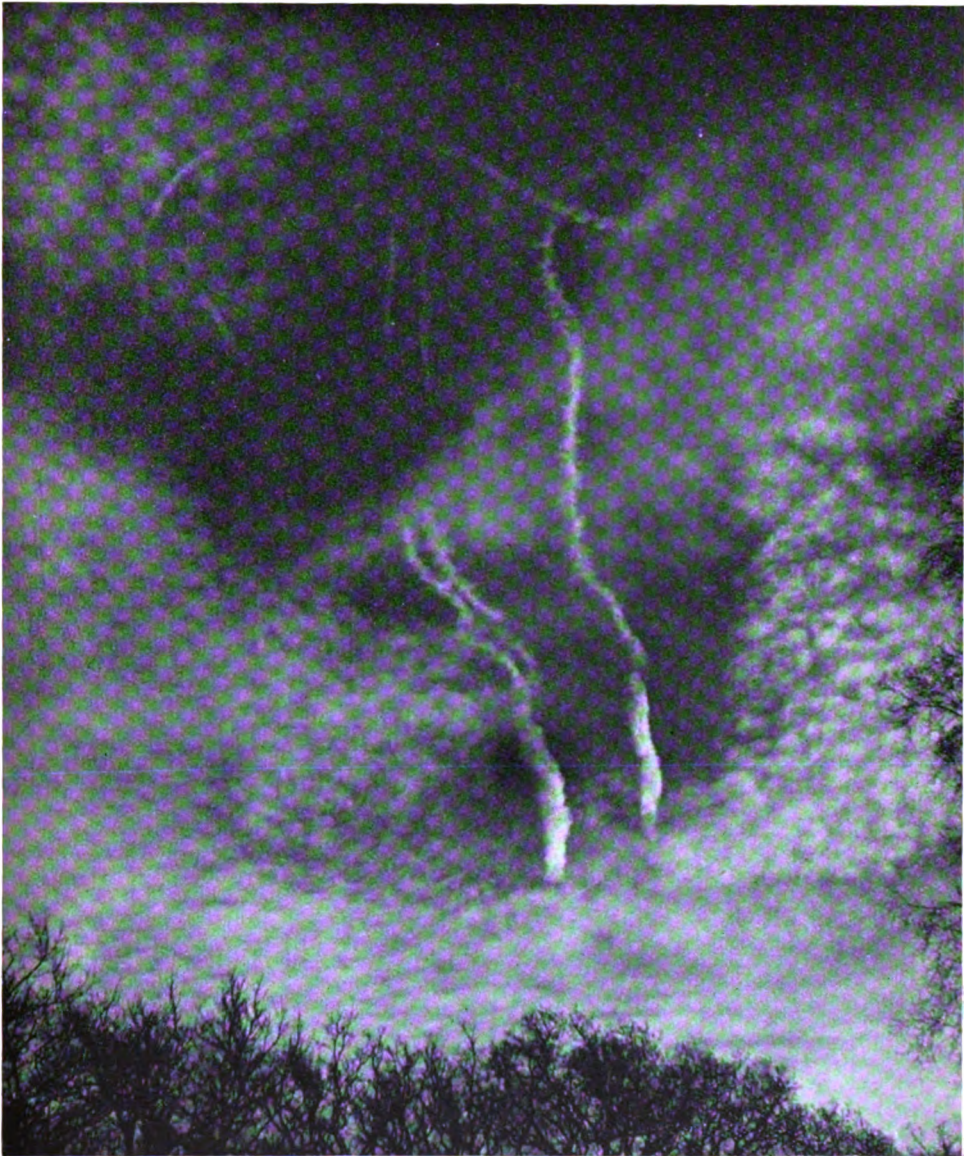


Photo : C. J. P. Cave, M.A., F.R.Met. Soc., F.R.P.S., and reproduced by courtesy of the Royal Photographic Society.]

CLOUD FORMATION IN THE EXHAUST GASES FROM THREE AEROPLANES.

(Further particulars will be found in the preliminary Notices to this number of the R.A.F. Quarterly.)

Napoleon's, we see not human degeneration, but the terrible power possessed by the inertia of geography.

Everywhere we see humanity disregarding the power of geography, crossing its barriers, building up empires, but—geography wins in the end. Is it too much to assert, when we look at the map of Europe, with its absence of geographical obstacles, as the Treaty of Versailles left it, that the story of Europe has hardly begun?

If geography gives a people its security, there is no nation on the Continent of Europe which has security in a marked degree. In the security which mere distance can give Russia towers above all the others. The security which was given England by the English Channel, and which has counted for so much in her history, is threatened by modern arms.

We may, if we like to amuse ourselves by attempting to visualize the future, ponder over the map of Europe as it is to-day with the nations' frontiers becoming of less and less importance in this fundamental matter of security, and we can wonder if the League of Nations will find it possible to stave off the inexorable result of the influence of geography on future history.

If the boundaries of Poland, Rumania, Czecho-Slovakia, Austria, Hungary, not to mention Lithuania, Esthonia, Finland, and that remarkable conception, the Polish corridor, are examined, the words of Ulysses, himself a man who learnt something of geography, come back to our minds, and we may wonder whether "some work of mighty note must yet be done, not unbecoming men that strive with gods."

THE PRINCIPLES OF WAR AND THE ROYAL AIR FORCE: MOBILITY

BY SQUADRON-LEADER E. L. HOWARD-WILLIAMS, M.C., *p.s.a.*

*" Benjamin's mess was five times as much as any of theirs."—
Genesis, 43, 34.*

WHICH is the more mobile, the hare or the tortoise?

The legendary race between these creatures serves to remind us that speed is not mobility. For the hare is mobile because it can make its form when and where it pleases and, if its wife will hear of such a thing, can leave home and live on the surrounding country; whereas our friend the tortoise can only be said to be mobile in that it carries its home on its back. If we consider the matter carefully, we find that their respective mobilities really depend on what they are going to do. This, I think, shows that the word " mobility " spoken of generally may only be so much jargon. Before it can become sense we require an answer to the question: " What is the problem? "

In the Royal Air Force then, what is the mobility problem? We can all give some answer to this. The difficulty is to choose those words which best describe it. I am going to suggest our fundamental mobility problem is not only to be able to concentrate our aircraft at any given place, it is also to ensure that once concentrated they have the personnel and equipment to enable them at once to do the work for which they are required. By that I mean, it is not sufficient merely to obtain strategic mobility; aircraft must be able to operate tactically afterwards.

Some excellent essays have been written on the subject of mobility in The Royal Air Force. I do not presume to vie with them in their merit. But what do they all amount to? I offer the following as five of the more important features, which we will in turn investigate:—

- (a) The organization of airbases.
- (b) A rapid supply system between airbases.
- (c) Reliability.
- (d) Speed and rapid refuelling arrangements.
- (e) The amount that aircraft can carry with them from one airbase to another.

ORGANIZATION OF AIRBASES.

Supposing we had, as indeed we almost already have, a series of airbases spread out all over the Empire, organized on lines separate from the Squadrons that occupy them. Supposing that we did not locate our Squadrons in any one place, but kept moving from one airbase to another, so that they would only remain, shall we say, three months, six months, or a year in any one district. Would there be any advantages over the present system? I think so.

Squadrons would be more mobile in the true sense of the word, and would gain more practice and knowledge of moving about the world. Were they periodically sent to an airbase near a depot to refit, the quantity and value of stores kept at distant bases need not necessarily be large. And personnel could be reduced to the minimum required to fly and maintain the Squadron as a fighting force. All administration would be relegated to the airbases, so that Squadrons would be able to complete their functions of flying and fighting anywhere, and ready to move off at once.

On the other hand there would be disadvantages. Personnel would not know as much about one place or any particular type of work as they know under the present system. It would practically mean putting Squadrons "in commission" for a definite period. Personnel would move freely from one command to another. Certain spares for more than one type of aircraft would have to be kept at most airbases (though this will probably be necessary anyhow).

And how would these airbases be organized? They would probably consist of a commandant, an adjutant, stores and accountant sections, cooks and other personnel capable of administering a couple of Squadrons, with stores to enable about six Squadrons to operate for a month tactically until further supplies could be sent. At most of these airbases obviously a Squadron or Squadrons would be in temporary occupation for months at a time. The point is that only the base would be permanent, immobile. The Squadrons, on the other hand, would constantly be on the move.

Admittedly, such a plan depends largely on the supply services.

RAPID SUPPLY SYSTEM BETWEEN THE BASES.

It appears to me that a good stores system should consist of three main features, reserves at a depot, stocks at the airbases, and lastly but not least, an efficient plan for rapid supply. The quicker stores can be sent, the less the amount of capital that has to be idle, both in the quantity of stores and in the size of buildings. I suggest the function of a Stores Depot should be to ensure that when supplies are ordered they are already stored, packed and are immediately sent off under

some scheme of prompt despatch and delivery. I further think that the signals service could assist to achieve greater economy here, to enable us to reduce yet further the supplies we must hold, and the time lag between demand and supply. In the event of operations such a system would be of the greatest practical value, as it would tend to speed things up. Concentration of effort !

RELIABILITY.

The third feature I have chosen is reliability. This is so obviously vital to mobility that little more need be said here. The present thorough maintenance and inspection systems do much to ensure this. Indeed, I do not think we can hope for any great improvement in this direction yet.

SPEED AND RAPID REFUELLING ARRANGEMENTS.

On the other hand much remains to be done to quicken refuelling. The speed of aircraft obviously has a considerable bearing on mobility but not so much as is at first sight apparent. An aircraft which takes two hours to get from A to B and one hour and ten minutes to refuel, is not faster from the point of view of mobility than one which takes three hours to get from A to B and ten minutes to refuel. Put in another way the aircraft with 50% greater cruising speed is not necessarily more mobile than the one without this increase in speed. And an aircraft with 50% greater cruising speed is probably at least five or ten years ahead of the slower ones !

I suggest, therefore, that one of the problems that we have to face in mobility is rapid refuelling. This obviously means pressure operated tanks, and other equipment.

THE GEAR THAT AIRCRAFT CAN CARRY WITH THEM FROM ONE AIRBASE TO ANOTHER.

The last feature I have given is perhaps the one that offers most opportunity for progress. Imagine a Squadron or ordinary general purpose aircraft that have room in their back cockpits to carry their total bomb load in extra personnel, tools, and equipment. Imagine their tools designed for lightness, in the same way that aircraft fittings are designed, to enable a greater number of tools and more personnel to be carried. Why, with our present aircraft we could carry three people in the back seat, together with enough equipment and gear to enable us to operate for a month until reinforcements arrive.

From this it is a short step to consider how practical it would be were general purpose aircraft built so that their total disposable weight could be carried in any one of—

(w) Bombs for operations or reinforcing out-stations.

(x) Personnel for mobility.

(y) Petrol for mobility or long range work, and

(z) Food and water for victualling troops in emergency ;

or some combination of all four, at our will.

In the foregoing, I have tried to make the point that we can make our Squadrons considerably more mobile than they are already, if we attend to the five features we have discussed. And I suggest that we can perhaps learn a little from both the hare and the tortoise.

“ To thy speed add wings.”—MILTON.

LEADERSHIP

BY SQUADRON-LEADER E. L. HOWARD-WILLIAMS, M.C., *p.s.a.*

LAST January an excellent article on The Development of Leadership and Morale in The Royal Air Force appeared in *The Royal Air Force Quarterly* from the pen of Wing-Commander Gordon-Dean. I am provoked to controversy on the subject by reason of its obvious importance to our service.

"Dux erat ille ducum."—OVID.

Who am I to write of leadership in a land where morale is omnipotent and whose leaders are legion? Perhaps the pride we all have in our own heroes can be made excuse for an analysis which may well do no serious harm.

It is, therefore, in no sense of criticism that I venture to present what has turned out to be more a digest than the review I had intended; for I suppose, in what follows, that the study of leadership should not be confined by an intimate inquiry into the public and private lives of The Great Captains. As a gentleman of no particular importance said, I believe, in the seventeenth century:

*"To the Devil with History,
What is the Problem?"*

* * * * *

It is reasonable to surmise that most of us have minds, fears, and wills; and that these contribute to our temperaments, which, not unlike the springs of a car, react in environment to the variety of those many forces that ultimately control our actions. But this is not all. The influence of other people may readily induce further pressure upon any of us, either with or against our personal wishes. These two systems, internal and external, together or separately, will impel us to one side or the other in the somewhat complicated struggle that consciously and subconsciously decides everything we do.

Consider ourselves collectively. We are reasonably impulsive people of average intelligence, prone to be influenced by dominant personalities who are probably at least as impulsive and intelligent as we are. It is not therefore surprising that the result is similar to the mechanical problem in which two systems of alternating power, superimposed upon each other, are liable to synchronize at certain periods; in this way to build up ever-increasing forces until, finally, something

snaps. In the realm of mechanics these phenomena are frequent. Indeed, the study of this subject presumes largely to ensure that forces are not allowed the liberty to synchronize.

Shall we, therefore, briefly examine the man as a machine, for evidence that the problems can be fundamentally similar, whether we explore them separately or collectively? When all is said and done, a machine is designed with definite features. It has certain usages and a history of its own. A shop foreman controls its effort.

Further, to press the analogy of simple mechanics, if man takes the place of machine, then morale will take that of *matériel*. With man as the unit morale is his equipment, of such parts as ability, discipline, health, and the more intimate mental processes of godliness, integrity, and will. The point is that leadership represents control, and is responsible for the utility of morale. In a machine shop this is where the foreman comes in.

Looked at in another way, morale is a state of moral and physical fitness. The citizens are of two classes: an aristocracy of the mind and the body commoners. Both are represented. Leadership is the government, in supreme control, responsible, and vital.

How shall we analyse this power of leadership? It may be said to be an abstract quality, usually associated with an individual who owes his strength to some combination of the following three main features:—

- (1) Prestige,
- (2) Power to convince, and
- (3) Force of character,

one of which will in all probability predominate.

Prestige implies established culture, symbolized by the sentiment that maintains the system. Tradition, pomp, ceremony, discipline, punctuality; these are the props of a leader whose power is due largely to his authority. He can lack ability, and may even have no particular strength of character; yet he will be successful if he realizes his weakness and remains apart in general from his followers. In other words, he need not be born a leader. Indeed, the Church and Services train them in large numbers. They flourish during times of peace, if they are up against no particularly dominant opposition: when reaction and conservatism are the sides of the ladder to success. These leaders may be tolerably fortunate, due to the professional ability of those who support them, and to the inertia of the system they represent. They may even pass their authority to their successors.

"The spirit of Elijah doth rest on Elisha"

(II Kings, ii, 15).

It might be said of Patroclus when he donned the shining armour of Achilles before Troy that he typified the leader who owes his strength to prestige rather than to any inherent powers of command. Once shorn of his sceptre he was impotent.

On the other hand, a leader who owes most of his success to his power to convince is one who relies on intuition and a quick wit to express and form the thoughts of those who hear him. With ready tongue, with the will and ability to compromise when necessary, he is prominent at a time when conferences and debates decide courses of action.

But by far the most powerful leaders are those who owe their careers to force of character. History gives us ample evidence of this in the lives of national heroes. These men are born leaders. They impress and sway their followers by personality, ardour, and by their sincerity. They seek responsibility that others are content merely to shoulder. They are essentially practical. They would willingly do what they ask of their followers. They have the courage to try new methods, not being afraid to make mistakes nor to outrage precedent. Their strength lies in the confidence they have in themselves. It is, however, significant that though these leaders may gain their authority by personal character, they can only maintain it by professional skill. Of such leadership, Stephen Phillips in "A Man," has written the following delightful lines:—

*O, for a living man to lead
That will not babble when we bleed;
O, for the silent doer of the deed!
One that is happy in his height,
And one that in a nation's night
Hath solitary certitude of light.*

Having, as it were, scrutinized the differences in leadership, let us look for those traits that are essential to a great leader, that are common to men like William Pitt, Garibaldi, Charles Gordon, Mussolini, and the host of others that will occur to you. I find courage, vision, skill, vigour, idealism, and essential concentration, without which it appears impossible to achieve much.

In the shadow of this analysis we can see our own particular heroes and friends.

It should, however, be emphasized at this stage that, so far, we have rather confined ourselves to public men, and have not yet considered the claims of those who do not necessarily lead in the grand manner, yet who do not fail, and who equally fulfil the conditions at which, rightly or wrongly, we have arrived.

It must be remembered that many great leaders have probably

wrought considerable misery and carnage as a direct result of the power they wielded. Without going deeply into history to support this, what good did Napoleon do for Europe? Look at it now! What of the Mahdi's work in the Sudan at the end of the last century? Read Slatin's book, "Fire and Sword in the Sudan." Morris says of Hannibal:

"The success of his armies would have been a calamity to mankind."

As a more modern example, one has only to mention the name of Lenin.

We must be careful!

In his time, and in much the same way as we now talk of Mr. Bernard Shaw, people used to ask, "What does Doctor Johnson say?" And I, unfortunately, do not possess a library of Mr. Bernard Shaw's works to illustrate this point what did Doctor Johnson say?

"Still less is it safe, in the pursuit of generalized truth, to overlook the personality and influence of great men, who are often in large measure the cause of some tendency which only they rendered inevitable."

We are thus rather led to conclude that good leadership requires something less than the qualities of some of the great captains: in other words, a system of leadership is better than its despotic isolation. It is perhaps, therefore, fortunate that leadership is not the prerogative of a few. Indeed, I am not at all sure that the best study of the subject does not lie with those who lead and obey at the same time, without ever becoming known to the mass of the people, who are uncommonly bad judges and notoriously liable to hysteria.

Can we learn anything from these lesser men? Why do they not rise to the top? For many reasons, the first of which is obviously that they do not all possess to a marked degree the qualities we have just analysed. And supposing they had these qualities, there would still be no place for them all at the top. The standard would clearly have to be yet higher. Again, some of them obviously have not the personality to lead, while others have not the skill. For those that have both, fortune may not find the large part she must play to project them into the limelight of fame. A bullet, or even a fly, may end a career at the outset. Had Hasdrubal not been assassinated, Hannibal may never have commanded the armies of Carthage. Napoleon, moody as a boy and disliked, was nearly dismissed the Army for brawling: he was imprisoned, and might have finished his life as a criminal. Wellington, but for the fact that his uncle was Governor-General in India, would probably have been court-martialled

for the disastrous night attack he made without reconnaissance. Nelson was not hit at Copenhagen, nor was he drowned.

It is therefore reasonable to suppose that many others of equal calibre were in some way thwarted from rising to supreme control. It is then a short step to find that in our midst are many with the virtues of the great but who do not meet that set of circumstances, over which a man may have no particular control, to make them famous. The rise of Lawrence in Arabia is perhaps an outstanding example of a man who, within our own memory, was projected to leadership in the grand manner and had the qualities essential to the task.

In our own country times are now quieter. There is not always occasion for us to seek national heroes. We are too busy. There is a German proverb to illustrate this :

“ Wenn das schiff gut geht, will Jeder Schiffherr sein,”

which, for the benefit of those who may not read German, perhaps may be interpreted “ In a calm sea every man is a pilot.”

In fact, then, it is not so much that leaders are scarce as that the processes by which a man may become great are infinitely more scarce. By far the larger number of us are cast in a frail mould, with personal ambitions, of average moral courage, with ordinary powers of concentration—and comfortable. We, the great majority, can be trained. We owe our strength to the system that makes us. Taught to obey and to lead as part of a plan, we react to the definite principles we understand. In peacetime, or as part of the machine of war, we only break down when faced by opportunities and opposition that demand something higher and nobler than our characters have to offer.

We are thus brought to a modern outlook of leadership, synonymous with Henry Ford's “ Service, not Self,” complimentary to what we know as “ the team spirit,” with the knowledge that those in authority who are leading us are behind us.

Can we say at the end of this essay that, from our own personal observation and thought, it is when we fail to observe the cardinal principles of leadership that we fail to lead?

I think so.

And there are many at sea who will sing with Cardinal Newman :

“ Lead kindly Light, amid the encircling gloom,
Lead Thou me on.”

“FUNDAMENTALLY AQUASTRIAN”

Being an Article on Flying Boats in Peace and War

BY WING-COMMANDER (ACTING GROUP-CAPTAIN) R. M. BAYLEY,
D.F.C., *p.s.a.*

[Just prior to going to press, news was received of the death, in the Red Cross Hospital at Athens, of the author of this article. We can only express our deepest regrets at the loss of an officer whose ability and wide experience were of such incalculable value to the Service. —EDITOR.]

UNTIL quite recent years, the flying boat has been the Cinderella of the flying services; during the War 1914—1918 it performed good service, although limited by scope of design. This was due to several reasons, mainly fundamental, although lack of interest contributed.

Although, for technical reasons, the development of the flying boat does not lend itself so readily to the rapid steps which marked the production of first-class war landplanes by the end of the war, there is no doubt that the flying boat did suffer severely, especially immediately after the war, and it is no exaggeration to say that the years 1918—1924 were a period of complete stagnation in flying-boat design. Indeed, it is significant to compare the present-day enthusiasm, rivalry and optimism among both the designers of flying boats and the Service personnel who attend them.

The object of this paper is therefore to trace briefly the strides made by the flying boat during the last eight years, and to examine its potentialities in peace and war, in particular relation to the Empire.

Whatever may be advanced to the contrary the flying boat is at present an aircraft designed to use the sea as an aerodrome. The “ship with wings” will undoubtedly come in time, but it is not yet in sight. It follows then that flying boats do not use the water as a means of transit, but as a medium for alighting, taking-off, replenishing and resting. The hull secures the buoyancy, and across this the superstructure is saddled; the hull acts as a fuselage and undercarriage combined, contains all the equipment, and accommodates the crew. It is fitted with steps in the ordinary way to facilitate hydroplaning, and usually a V-bottom, varying in depth with design, to soften the shock (if any) of alighting on the water. On the water,

it behaves like any other surface craft, except that it always swings into the wind (if stronger than the tide), and it cannot go astern. The latter is indeed worth remembering, and enables one to visualize the difficulty in manœuvring a large flying boat, with several engines tending, although only ticking over, to pull her forwards, in narrow and congested waters, with awkward winds and tides.

The ocean-going flying boat being definitely not yet within sight, it is the policy to develop the flying boat in its capacity as an aircraft. It must not be inferred from this that the development of flying boats to larger types is not being steadily pursued; it is indeed being pursued with enthusiasm, subject to the distressing financial conditions obtaining at the moment, and the future of the big flying boat will be discussed later. It is also the policy in present stages of development to use in the Service the smallest type which will satisfactorily fulfil requirements, so that it may be used on small stretches of water, rivers, etc. There should then be no necessity to develop several classes of flying boats for uses under different conditions.

It is, of course, possible that in aiming at one type of flying boat, capable of carrying out the large number of duties assigned to it, we are going in for something extremely expensive. For instance, the rôle of flying boat squadrons at home differs from that overseas, and it is probable that the requirements could equally efficiently yet more economically be met by a small boat of medium range, chiefly for home service, and a long-range type for overseas. The duties of flying boat squadrons depend quite considerably upon their location; home squadrons will be employed largely on trade routes converging upon focal points around the British Isles, whereas overseas squadrons are more likely to be used for coast defence, extended reconnaissance, and separate air operations.

For convoy, escort, anti-submarine patrol, reconnaissance, bombing at moderate ranges, two small boats are generally better than one large one, and it is interesting to note that the cost is approximately identical. Overseas, however, the question of reinforcing becomes paramount, and the distances to be covered are great, *i.e.*, United Kingdom to Gibraltar, Gibraltar to Malta, Singapore to Hong Kong. A greater range in operations themselves is also required, and a greater ability to operate self-contained.

Flying boats are free from elaborate organization, and there are very few places from which they cannot operate; every day new advanced bases are being found and formed; such bases are far more numerous than those from which landplanes can work. In fact, the landplane is virtually tied to expensive and prepared strategical routes, and its mobility is entirely determined by the limits of such a route. This is not so with the flying boat; no preparation is necessary beyond

ensuring petrol and oil supplies in some suitable bay, creek, river or lake. Moorings are desirable, but they are by no means essential. In such circumstances, flying boats are the only heavy aircraft which could be used for perhaps several months. In short, this class of aircraft possesses the greatest strategical mobility of all types.

SEAWORTHINESS.

But to be capable of use in many diverse places, the flying boat must possess seaworthiness. When used in connection with seaplanes the term " seaworthiness " is divided into two parts: (i) ability to manœuvre or ride at anchor in a rough sea; and (ii) ability to rise from or alight upon a rough open sea without sustaining damage. In the first category, a rough sea may be described as that which can be expected in a reasonably sheltered piece of water in stormy weather. In the second category, seaworthiness is a problem more difficult to face, and a breaking sea five to six feet high is termed a rough sea. But the function of the flying boat, after all, is, as she is at present built, to remain in the air, and only use the water as an aerodrome. Yet in fair weather the open sea can be used when on patrol, which is an asset, as it is in certain circumstances a tactical advantage to play a " waiting game," and not be compelled to remain in the air continuously. This does not imply that the flying boat of to-day could or would attempt to do this in a rough open sea; for this, the " ship with wings " must be awaited, with the highest degree of seaworthiness.

Seaworthiness is the most vexed problem of all. There are many who contend, and with reason, that flying boats will be of very restricted use if they cannot live through a normally rough sea; that the argument of multi-engines does not apply when a deliberate landing is made; that the first desideratum of the flying boat is that it should survive. There is much wholesome truth in these contentions, but at present they are rather postulating the ideal, and it must be recollected that multi and reliable engines do much at least to enable the boat to seek a reasonably sheltered place in which to make a landing in the event of partial failure.

It is agreed that seaworthiness in flying boats is essential, and that a high degree of seaworthiness vastly increases strategical mobility and operational value, but seaworthiness is inevitably linked with performance, and with modern aircraft performance is essential. In flying boats, good cruising speed and range are the requirements which count most vitally, and the low cruising speed of the *Southampton* constitutes its main disadvantage. For example, a 30-knot head wind reduces its cruising speed by no less than 43%. On a flight to Gibraltar (1,100 sea miles), if the conditions were still

air, the *Southampton* would have to travel 860 miles further to counteract the effect on cruising speed of this 30-knot head wind, but a flying boat with a cruising speed of 100 knots would only have to travel 500 miles further.

Therefore it appears that seaworthiness and performance are required, in modern flying boats, in approximately equal proportions, dependent to a certain extent upon the type. The result is, and inevitably will be, a compromise, but then every aircraft is. This, the writer submits, is the fairest way of putting it.

NEW TYPES.

The aim is to produce a range when required of about 1,500 sea miles and a cruising speed of 100 knots, together with high degree of seaworthiness and good accommodation.

OPERATIONAL EFFICIENCY.

Apart from improvement in general characteristics, greater efficiency may in future be expected from :—

- (i) Anti-corrosive devices.
- (ii) Method of carrying and changing spare engine.
- (iii) Bomb-loading on the water.
- (iv) Moorings, anchors and dinghies.
- (v) Refuelling devices.

And development common to all types should be :—

- (vi) Provision of mechanical aid to pilot.
- (vii) Auxiliary machinery to work bilge and refuelling pumps, anchor gear and bomb-winches.
- (viii) Increased stowage for spares, large and small; more lockers.
- (ix) Maximum fuel tankage to be permanently incorporated.

Incidentally, perhaps the bugbear of all flying boat pilots is over-loading, which, like the poor, will be always with us, and it is interesting to make a reference to the "extras" carried in an ordinary *Southampton* for a fortnight's cruise in the Persian Gulf. When it is remembered that the normal all-up flying weight at home of the *Southampton* at the time of the test (1929) was 15,200 lb., in a temperature where normally a reduction of 25% is imperative, this flying boat performed creditably with an increase of 600 lb., or 4%.

Flying boats require bases for major repair just as much as surface vessels; their efficiency depends on this, although they are more than

any other type of aircraft capable of acting for long periods from an improvised base, or advanced refuelling point. Given petrol and oil and some unskilled labour, all should be straightforward. The surface vessel tender is wasteful and slow; it is expensive, and being very immobile, itself completely hampers the strategic mobility of the flying boat it serves. It is useless to consider operating it over a great distance overseas, such as the present East Indies station which extends from Aden to Singapore. Until, therefore, a base is established, flying boats must be self-contained, or supply themselves.

The requirements of an advanced base are very simple, especially if spares, when required, are obtainable quickly; an example of this is given later. In the near future such bases will be dotted all over the Empire, enabling flying boats to proceed at will almost where they please.

The larger type of flying boats will be useful for communication and transport, and as tenders to other aircraft. Certain of our essential strategic air routes, Port Sudan—Aden, Basra—Karachi *via* the Arabian shore, Rangoon—Singapore, involve flights along wild stretches of coast-line where land communications are non-existent, water scarce, and certain sections involve long flights over the sea. In some circumstances they will probably be the only means of communication for many days. Their great value as escorts to land-plane squadrons on overseas flights is obvious, and viewed from this standpoint flying boats are an essential part of an imperial air route system. As a quick means of communication the flying boat again is ideal in undeveloped coastal regions. For instance, the Political Resident in the Persian Gulf, to carry out a three days' visit to the Political Agent, Masqat, requires by existing sea communications an absence of nineteen days from Bushire. If he goes by flying boat he reaches Masqat the same evening, and thus the total visit entails an absence of but five days.

TRAINING AND PERSONNEL.

There is no mystery about the working of the flying boat; the great art in managing it is to (i) get it off in a sea without damage, and to put it back again; (ii) handle it properly on the water prior to getting off and subsequent to landing.

Two mottoes are suggested—both applicable before the state of becoming air-borne and subsequent to the state of being water-borne:

Never be in a hurry.

Keep your crew dry.

It is frequently contended by those of a mathematically accurate turn of mind that the crews of flying boats should be standardized.

This is difficult to justify, as the size and quality of the crew must depend upon several factors, the chief amongst them being the nature of the operation; the question of whether boats are working singly or in company; W/T requirements, automatic assistance to controls; and nature of armament carried. Normally, any number of crew exceeding five should be regarded as "alternative load," as each additional member also entails extra lockers, food, water, bedding, arms and baggage, when on cruise.

ATTRIBUTES IN EMPIRE DEFENCE.

Before examining the particular rôle of the flying boat in Empire defence, the writer wishes to draw attention briefly to the following attributes of this aircraft:—

- (i) It has capacity for accurate navigation over long distances over the sea out of sight of land, with excellent facilities for using charts, compasses and other navigational instruments, in comfort.
- (ii) It possesses a high degree of self-dependence, together with good accommodation for personnel and spares.
- (iii) It is good in self-defence, and its vulnerability has often been much over-stressed. The armament usually consists of four machine-guns, with an excellent field of fire, particularly from the tail-turret; there will be three or more engines, petrol in wing tanks, two or three pilots. If properly fought, there is little doubt that modern flying boats, especially if in company, are a formidable objective for attack by single-seater fighters. The writer cannot help remarking that there used to be an idea sedulously propagated by the more elderly and old-fashioned flying boat pilots that on attack, a boat had to come down and be flown just above the surface of the water to avoid attack from below. It is hoped that nothing again will be heard of this pernicious theory now that we have flying boats worthy of the name.
- (iv) The dangers of anti-aircraft fire must not be exaggerated, for there are antidotes. A very effective form of plug can be used for smaller holes, while for larger ones, quick patching is quite effective in a metal hull. There are also bulkheads, so that if badly holed, it does not follow that the flying boat will sink on landing any more than a ship does.
- (v) There need be no hesitation in flying long distances over land, as the risk of engine failure is naturally reduced in multi-engined aircraft.

TRANSPORT OF TROOPS BY AIR FROM EGYPT TO 'IRAQ, JUNE, 1932.



ARRIVAL AT HINAIDI OF THE FIRST "VICTORIA," No. 70 (BOMBER TRANSPORT) SQUADRON WITH A CONTINGENT OF THE NORTHAMPTONSHIRE REGIMENT ON BOARD.



"C" COMPANY DEPLANING.



"B" COMPANY, 1st BATTALION NORTHAMPTONSHIRE REGIMENT, ENTRAINING FOR DIANA ON ARRIVAL BY AIR FROM EGYPT.

In reviewing the rôle of flying boats in peace, it is not proposed to enter into detail, as the majority of their routine duties are familiar. Beyond these, there is the initiation of new Empire routes, such as the Arabian littoral route down the Persian Gulf from Basra to Karachi, and the various routes emanating from Singapore. These routes they patrol and police; it is, in fact, " showing the flag "; mention may again perhaps be made of their use in the conveyance of Political and other officers.

It is, however, in time of war that the flying boat will show to its greatest advantage, and so varied will its functions be that it is proposed for the sake of clearness to examine them under separate headings.

GENERAL.

The flying boat will probably be used principally in the narrow seas and along our great Imperial coast-line. It is useful both for operations across intervening land, and operations against objectives inland which are reached across intervening sea. The flying boat has already been shown to be capable of rendering more diverse service than any other class of aircraft, while by reason of its capacity to fly over land or water and to dispense with land aerodromes, it is also more mobile than any other class of aircraft.

PROTECTION OF SEA COMMUNICATIONS.

It will take a large part in the safeguarding of trade routes, especially at focal points such as the Channel, Gibraltar, around Malta, Alexandria, Calcutta, Straits of Malacca. In these, by virtue of its speed, offensive powers, and its ability to summon surface or other air forces, it will be invaluable. The difficult task of locating commerce raiders will be rendered easier, as also their subsequent attack by submarines or surface craft. It will require little imagination to picture how much quicker the *Emden* would have met her doom had there been but a few flying boats in the Indian Ocean. For operations of this nature, the flying boat has almost every advantage, while in convoy and anti-submarine patrol, its value is beyond question.

COAST DEFENCE AND DEFENCE OF PORTS.

For the flying boat, the one vital aim must be to secure the Commander of the Port from surprise. It must locate and keep in touch with raiders, or a seaborne attack on a large scale, and must summon other forces, if necessary. Dawn and dusk patrols will be a ceaseless routine, for taking an average of twelve hours darkness, a fleet can only move 250 miles, or a large convoy 120 miles in that time. Accurate and widely-cast reconnaissance, efficiently planned and carried

out by flying boats, can go far towards discounting the "attack at dawn" theory. The flying boat must keep watch upon our own mine-fields, prevent the enemy from laying his, and hamper and attack his submarines.

It may be accepted that the ideal form of defence for a port in war is a combination of heavy guns, medium guns, aircraft, ground forces and seaward defences.

Whatever may be one's individual views on the relative merits of big guns and torpedo aeroplanes, we cannot afford to provide defences all over the Empire which can do more than prove a reasonable deterrent to hostile attack, and it is certain that whatever the form of defence, the flying boat will play a large part.

REINFORCEMENTS.

On the outbreak of war, in any but an exceptional conflict, flying boat squadrons are likely to be the busiest of all, both at home and abroad, again on account of their versatility. They possess great capacity for reinforcement under their own power, and, having arrived, to start work at once, pending the arrival of their stores and personnel.

The following is considered a reasonable estimate of the time they would take to reinforce overseas, allowing only for flying by day; night flying is practised now in nearly every flying boat unit, so that for the future this estimate can be reduced by at least 40%.

United Kingdom—Singapore	...	...	...	18 days.
United Kingdom—Trincomalee	...	...	...	12 days.
Iraq—Singapore (round India)	...	...	...	13 days.

It is here that the larger type of flying boat will surely display its value. We are already reaching the stage where it can fly from the United Kingdom to the East without touching foreign territory. Any point on our Imperial overseas routes can be reached; such points include Aden and Somaliland, Singapore and North Borneo, even Hong Kong in favourable circumstances; also Haifa, Cyprus and our various possessions in Africa. Furthermore, when the term reinforcing is used in the air sense, it is meant in the widest sense; aircraft reinforce, by reason of their mobility, not one single garrison, but a whole area. It is not claimed that this is an attribute peculiar only to flying boats; it is peculiar to air forces as a whole.

SEPARATE AIR OPERATIONS.

In any major war there are always subsidiary objectives. It is the policy to exploit to the fullest advantage the high mobility of aircraft over long ranges, and the objectives which will be selected for attack

will not remain the same, but will change frequently as the campaign proceeds. At one time, one kind of objective may be the best one for air forces to attack, while at another, the fullest effort might be gained owing to a change in the general war situation, or shortened hours of daylight or darkness, by attacking another kind of objective altogether. In effect, air forces will be turned against the objective which is the best at the time. No type of aircraft for this varied offensive is more suitable than the flying boat, with its disregard for stereotyped bases. Moreover, flying boats can operate sometimes for topographical reasons, or by reason of the military commitments which may be involved, where it is impossible to provide a landplane base. An objective which comes to mind is an inland sea upon which the enemy may be dependent for his supplies and reinforcements; in these circumstances, the flying boat is probably the only class of aircraft which can be employed.

AIR CONTROL OF UNDEVELOPED COUNTRIES.

The value of air power for effective and humane control of undeveloped countries, combined with economy, is now widely accepted. The flying boat, suitably armed and backed by secure but inexpensive routes and refuelling points, is ideal in such places as the Red Sea, the coasts of Somaliland and S.E. Arabia. Our present power to control, unless we send out an expedition, is limited to the range of a ship's gun; an offending tribe has only to leave the beach to escape punishment, while on occasions, even the beach may be out of range. Flying boats, however, can fly long distances inland, and attack the real centre of trouble lying in the interior, which has hitherto been immune. The flying boat is as economical in control of the narrow seas and coastwise areas as the landplane has proved over land areas—probably more so. It is noteworthy that when No. 203 (Flying Boat) Squadron first cruised up and down the Persian Gulf in 1929, what most impressed the local Sheikhs was the fact that they were able to fly inland as well as over the sea. The native, at least, is quick to understand!

Finally, the writer begs to be allowed to refer very cursorily to the ever-burning question of belligerent rights, and to claim that aircraft—and in particular flying boats—should consider what indeed their rights are. The point cannot be better put than it is in a book entitled “ Aircraft and Commerce in War,” by Mr. J. M. Spaight, of the Air Ministry.

“ The new arm should be allowed to ‘ start fair.’ It should know at least where it stands, and what are the rules of the game. The law of maritime war is in a chaotic state. If the air arm inherits the dismal legacy of the naval rules, if it has to work under the nightmare

handicap of a law which is hopelessly archaic and only tolerable because it is interpreted with a looseness that robs it of all real value, a position still more deplorable than that in which sea power operates at present will result. For the interference with neutral commerce will be on a greater scale than in the past; the occasions for friction and disputes will be multiplied manifold, and yet another argument will be furnished to those who regard all international law as an academic futility. The new arm should not have to begin its career as commerce-preventer bound by the letter of a law which only a cynical disregard for the spirit of it makes endurable."

To continue. A man-of-war can refuel at a neutral port; why cannot a flying boat? This does not in any way imply that it is not essential for this country to have flying boats capable of the distances to allow it to refuel without touching foreign territory. In fact, emphasis has been laid in this paper on the fact that we are aiming in new types at a range of 1,500 sea miles when required, together with a high degree of seaworthiness; that we are already approaching a stage where a flying boat can fly from the United Kingdom to the Far East without being dependent upon the permission of Foreign Powers. But here the writer is endeavouring to point out that the flying boat is not accorded the same latitude as that allowed to a ship of war. Whatever the range of the flying boat—or of ships, for that matter—it is obvious that the greater the number of potential refuelling points (Lisbon, Brindisi, Athens, Saigon, etc.), the easier the journey.

Again, why should not aircraft—and in particular, flying boats—fly over neutral country when merely reinforcing? It will be within easy memory of how the Russian Admiral Rodjestvensky refuelled in and freely used neutral ports all the way from European waters to the Far East in 1905.

There appears to be little doubt, unfortunately, that in this respect, flying boats are treated as armed land forces rather than as armed vessels.

On the question of "visit and search," it is freely contended that the flying boat cannot perform this function. Why not? Surely the flying boat can do so, especially when working in pairs. It is granted that there is always the question of prize crews, and the safe-placing of the captured ship's crew; but with the larger flying boat, a solution is the use of one of these aircraft to supply the prize crew, which submarine commanders have always insisted need only be small, and the use of the first ship captured as the place of safety for subsequent captured crews. Admittedly this would cramp the mobility of the future action of the flying boats, but it is incorrect on this account to say that the flying boat is incapable of "visit and search." The state of the sea and the ability of the flying boat to alight on it and

get off again must be the test of when and where it can be done, but in reasonable weather, it is maintained that not only can a flying boat examine a ship, but it can enforce its will upon it under penalty of destruction by the sister-aircraft which is in the air.

Moreover, let us not fondly imagine that in future wars, an unscrupulous enemy with powerful air forces will hesitate to use aircraft for unrestricted warfare against merchant shipping. It is inconceivable that the British Empire would initiate these methods, but it must be prepared to act in reprisal, and if such a course of action should ever become necessary, the flying boat is the best weapon with which to implement it.

As a final summary, the following, it is contended, are the points which should be borne in mind in thinking about the flying boat, present and future :—

As an aircraft, it possesses certain attributes which are inherent in all air forces; if it is to attain to its highest utility in the defence of the Empire, these are the attributes which must be developed and utilized :—

- (a) Great rapidity of action with extended tactical and strategical range.
- (b) Capacity to attack widely different kinds of objectives, on the sea, under the sea and on the land, and to turn, like all other air forces, from one objective to another.
- (c) High offensive power at relatively small commitment and low cost.
- (d) Definite independence of elaborate and vulnerable maintenance and organization, whether in peace or war.
- (e) Ability to reinforce in the highest sense, *i.e.*, to move rapidly from normal location to war destination—however distant.

The flying boat is the most versatile of all aircraft, and it requires the minimum of looking after. Invaluable as a vehicle of reconnaissance, it leaves little to be desired as a stout weapon of offence.

Outside Great Britain—beyond the zone of activity of the Home Defence Force, it must become more and more the link between ourselves and the rest of the Empire, by way of the immense coast-line which is ours, and the rivers and internal waters which lie within. To this Nation and to its Empire, the exploitation of the flying boat to its fulness cannot but be an asset whose value can scarcely be overestimated.

Even in these days of meagre estimates, let us make it our charge that we use this facile link in peace, this formidable weapon in war, to its utmost possible advantage; it is well worth it.

THE FIRST WAR DIRIGIBLE

BY FRANCIS GRIBBLE.

HISTORIANS of military ballooning pass, as a rule, very lightly over the story of the first war dirigible. Indeed, they often omit to mention it; and the omission is the more remarkable because the story is one in which the reader is introduced to the name of Zeppelin in the early days of the nineteenth century.

The Zeppelin of those days—the grandfather of the Zeppelin of our own time—was the King of Württemberg's Minister for Foreign Affairs. A stranger named Franz Leppich presented himself one day at the Württemberg Foreign Office. Count Zeppelin received him, and listened to him while he unfolded his plans for the production of a novel and very destructive military weapon.

This Leppich was a German, about five-and-thirty years of age, born at Mordersheim, in Franconia. He claimed to have served in the British Army, and to have held a Captain's commission in it; but that part of his story is not confirmed by the Army List. Possibly he had served in some corps of German auxiliaries under British Command. However that may be, he had given up soldiering and become an inventor. His first invention belonged to the arts of peace, being an ingenious musical-box, known as the *pan-melodicon*, which he exhibited to the curious at Vienna, Paris, and other musical centres. In this way he earned a modest living; and it was while he was thus occupied that he gave his attention to the arts of war, and found an opportunity of submitting to Napoleon a project for the construction of a dirigible balloon, from which he would be able to shower explosives upon his enemies and bomb their armies out of existence.

This idea of dropping bombs from balloons was an old one, first mooted more than a hundred years before balloons were invented by a Jesuit priest in a work published in 1670; but that was only theory. The Jesuit, indeed, expressed a doubt whether God would allow such things as balloons to be invented, in view of the "disturbance" which the invention would "cause to the civil government of the world." Franz Leppich entertained no such doubts. He claimed to be able to build a balloon which could be navigated and so brought immediately over the heads of those whom the navigators desired to bomb. He offered to make one for Napoleon, but Napoleon declined his offer, and ordered him—for what reason no one knows—to leave France.

The Emperor had no great faith in military aeronautics. He had not troubled to replace the aeronautical material sent out to him in Egypt and destroyed by Nelson in the Battle of the Nile. Probably he regarded Leppich as a wandering lunatic; and when, on the eve of his Moscow expedition, he changed his mind and sent for him, he

could not find him. Leppich had by that time gone to Stuttgart, and was there offering his invention to Count Zeppelin.

Zeppelin himself could make no use of it, all Germany being at that time either in alliance with Napoleon or prostrate at his feet. But his heart was not in the alliance. Like most other Germans, he was anxious to do Napoleon a bad turn if he could, so he gave Leppich an introduction to Count Alopeus, the Russian Minister at Stuttgart, and Alopeus, realizing that there was no time to lose, as war was obviously imminent, sent him to Moscow on his own responsibility, and reported to Alexander that he had done so.

He arrived at Moscow on June 8th, 1812—that is to say, about a fortnight before Napoleon crossed the Niemen. Alexander, much impressed by Alopeus's report, had ordered Rostopchin, the Governor of Moscow, to welcome him, to afford him every facility for the execution of his designs, and to keep his mysterious proceedings secret; and he was instantly set to work to make his dirigible in a nobleman's park, a few miles from the city, where his construction yard was presently inspected by Alexander himself, as well as by the Prussian, Stein, who had fled from Prussia to escape from Napoleon, and to prepare the way for a Russo-Prussian alliance against him.

Looking back on the story now, in the light of present-day knowledge, one can see, of course, that the experiment was bound to be a failure. Leppich had no engine capable of supplying the necessary motive power. His case, in that respect, was as hopeless as that of Leonardo da Vinci when he suggested that slave labour, stimulated by the lash, should be employed for the propulsion of the flying machines of which he dreamt. His idea, in so far as one can make it out, seems to have been that wings should be attached to the balloon and made to flap by the turning of handles, and that was clearly an inadequate device. But great expectations were entertained at the time. It was really believed that the airship would be able to cruise about at the will of the navigators; and it was proposed that it should seek out Napoleon's headquarters and blow the Emperor and all his staff to smithereens.

Naturally, the Russians did not boast about their dirigible after its imperfections had been demonstrated. Rostopchin himself complained, in after years, in the account which he published of the defence and burning of Moscow, that his enemies had talked too much about it for the purpose of holding him up to ridicule and contempt; and that may have been one of their objects, and that may also be one of the reasons why the serious aeronautical histories pay so little attention to this particular balloon. But there is no question that he took the dirigible very seriously at the time, and issued a proclamation about it in order to reassure the panic-stricken Muscovites.

First he called upon them to take heart because the invader was about to be assailed by a mysterious engine of war which would infallibly destroy him and his mighty host "in less time than it takes to talk about it." Then, in a later proclamation, he disclosed his secret, and announced that this marvellous tactical weapon was nothing less than a balloon, "in which fifty men could navigate the air, sailing either with the wind or against it."

But that was not all. We also have the reports on Leppich's work which Rostopchin sent to Alexander; and these, quoted in M. Walizewski's *Life of Alexander*, furnish abundant evidence of his belief in the value of Leppich's invention.

"He was delighted," he wrote to Alexander as soon as Leppich arrived, "to have made the acquaintance of a man whose inventions will put an end to war, deliver the human race from its infernal oppressor, and make His Imperial Majesty the arbiter of kings and the benefactor of humanity." Three weeks or so later, at the end of June, he wrote to say that he was "completely convinced" of the success of the invention, and had, in consequence, "made a friend of Leppich," and was looking after his invention "like a beloved child." Then, in July, there followed the announcement that good progress was being made, that he was recruiting a crew of fifty men to navigate the balloon, and that General Kutusoff, with whom he had discussed the matter, fully shared his confidence that it was going to give Napoleon the surprise of his life.

But it did not; and the rest of the story is quickly told.

The balloon was made and inflated. It had a rigid frame, like the Zeppelins of our own time, and it took five days to inflate. It was fitted with the wings which were to be flapped in order to propel it, and if the wings had been stronger the story might have been longer. But the story was short, because when the crew set to work to make the wings flap they broke. Leppich set to work to make new wings; but the French did not give him time to finish the job. They came and saw and conquered while the dirigible was still lying a helpless and immobile mass on the ground in the nobleman's park, where a number of them went to look at it. According to some accounts, the explosives which were to have destroyed Napoleon in his tent played a useful part in the destruction of Moscow; and Rostopchin, at any rate, withdrew all his previous commendations and wrote:

"This man Leppich is a lunatic and an impostor."

And that, for all practical purposes, was the end of Leppich. With his failure he disappears from history. A century was to pass before his invention was perfected by the grandson of the man who introduced him to the Russian Minister, and so gave him the opportunity of making his remarkable experiment.

A CAVALRY RECONNAISSANCE IN 1862

FLIGHT-LIEUTENANT F. C. B. SAVILE, R.A.F.

DURING the Civil War in the United States many daring cavalry raids were carried out by both sides.

At the time of the "raid" or reconnaissance with which this article deals the situation in Virginia was roughly as follows.

"Stonewall" Jackson was carrying out his famous operations against Banks and Frémont in the Shenandoah Valley. A large and well-equipped army under McClellan, of 105,000 men accompanied by a large siege train based on the York River, with its advanced base at White House on the Pamunkey River, was entrenched within sight of the spires of Richmond, the confederate capital. Another army, under McDowell, was at Fredericksburg and was expected to advance and join McClellan in the near future, when the Federals expected to overwhelm the Confederate main army, commanded by R. E. Lee, then entrenched about Richmond.

When the war commenced in 1861, neither side was equipped with any large trained body of cavalry. Most of the trained cavalry of the regular Federal Army was employed in the territories of the Far West, and the majority of the cavalry on both sides was supplied by volunteer regiments, senior officers in most cases being regulars, or West Point graduates. Of the Confederate Cavalry leaders who carried out these raids the outstanding names brought to mind are, Stuart, Ashby, Forrest, Mosby and Imboden.

Of the Federals perhaps Stoneman, Sheridan and Pleasanton are the best known.

Of these General J. E. B. Stuart was the outstanding cavalry leader of the war.

If "Stonewall" Jackson was Lee's good right arm, "Jeb" Stuart was his sight. Stuart combined in his one person the gallantry, gaiety and uprightness of a singularly pleasing personality. He was perhaps the last of the Knights. Always beautifully mounted and dressed, he added to his uniform some touches which, perhaps not strictly in accordance with the regulations, added to the brightness of the fame and honour in which he was held by both sides. His yellow silk sash and gold spurs were famous throughout the Confederacy and also in the Union.

It was absolutely necessary for Lee to strike a blow at McClellan before McDowell's Corps would be ready to advance. He at once

saw that a movement against McClellan's lines of communications might be attended by great results.

In order to carry this out, and to find out how far the Federal right flank extended, and on what it rested, J. E. B. Stuart was despatched on his famous raid.

The units taking part in this raid consisted of the 9th Virginia Cavalry, commanded by Colonel W. H. F. Lee; the 1st Virginia Cavalry under Colonel Fitz Lee; and the Jeff Davies Legion under Colonel Martin. The guns were a section of the Stuart Horse Artillery under Pelham.

No information was given as to the destination of the force, and it had been allowed to be rumoured that the expedition was headed for the Shenandoah Valley. One of the troopers was heard to shout "Good-bye boys; we are going to help old Jack* drive the Yanks into the Potomac," to his comrades left behind as the column rode out of Camp. The troops carried with them three days rations and sixty rounds of ammunition per man.

Early on June 12th, 1862, Stuart, with his twelve hundred cavalry and two guns, rode out of Richmond on the Brooke Turnpike. That night he bivouaced near Ashland, far out of reach of any Federal patrols. Orders were issued enforcing strict silence and forbidding the use of fires when in bivouac, as the success of the expedition would depend upon secrecy and celerity.

At break of dawn the following morning, June 13th, the troopers mounted, the march was begun without a bugle blast, and the column headed direct for Hanover Court House, distant about two hours' ride.

Here a scouting party of the 5th U.S. Cavalry was found in the village, but speedily decamped on sighting the Confederate column. One prisoner was taken after a hot chase across country. The raiders then moved rapidly to Hawe's Store, where a Federal picket was surprised and captured without firing a shot.

Hardly had this taken place when the Confederate advance guard was driven back by a Squadron of Federal Cavalry, sent out from Old Church to ascertain whether the reports of a Confederate advance were true.

General Stuart at once ordered Colonel Fitz Lee to throw forward a squadron to meet the enemy. A squadron under Captain Swann was therefore ordered immediately to charge the Federals, and so suddenly and courageously was this carried out that the Federals fled in confusion, but, having a start of two hundred yards only a few were captured, the remainder making good their escape after a chase of a mile and a half.

Captain Swann, finding the road here became very narrow, and the

* "Stonewall" Jackson.

brush on either side was a place so favourable for an ambushade, gave orders to draw rein and sound the bugle to recall his men.

Stuart soon arrived on the scene with the main body, and the advance guard commander, W. T. Robins, Adjutant of the 9th Virginia Cavalry, was directed once more to advance.

Robins at once dismounted his men and pushed up a hill to his front. Just beyond the hill, however, he encountered a force of Federal Cavalry drawn up in column of fours ready to charge along the road. Falling back, he reported this to Stuart, who ordered Captain Letané of the 9th Virginia to move forward with his squadron and clear the road. This was done, and when in sight of the enemy Captain Letané gave the order to charge. A confused running fight then took place which resulted in the retreat of the Federals who lost a number of prisoners, and the capture and burning of the Federal Camp at Old Church by Colonel Lee in spite of an attempted stand at this place.

The honours of war were thus definitely in favour of the Confederates, as they had surprised, taken in detail, and far outnumbered the Federals in this action. It was afterwards discovered that the Federal forces were commanded by General Philip St. George Cooke, father-in-law to General Stuart, to whom the latter sent a polite message!

The casualties in this skirmish were slight—one killed on each side, and about fifteen or twenty wounded on the Confederate side, mostly sabre cuts.

Halting a short time at Old Church the Confederates were regaled with food and drink by the people of the neighbourhood, their compatriots. Some ladies even brought bouquets and presented them to the officers as they marched along. One of these was given to General Stuart, who, always gallant, vowed to preserve it and take it to Richmond. He kept his promise.

It was four o'clock in the afternoon and Stuart was now well in the rear of the Federal lines. He was already in possession of important information. He had discovered that the enemy's right flank was unfortified and unprotected by any natural obstacle. It was necessary to return with this information to General Lee as soon as possible. Two alternative courses of action were now open to him.

The first was to return by the same route used in his advance. This would, in all probability, involve heavy fighting about Hanover Court House, as the Federals were certain to assemble a force near there to contest his passage.

If he attempted this with his small force the possibilities were that he would be cut off, and would be unable to get his information back to headquarters.

The second was to press on around the whole Federal Army, creating more confusion and damage, and gaining further useful information. The Federals would not be likely to expect this, and if the movement was carried out swiftly and with vigour, the chances of his returning safely to Richmond were more favourable than if he retreated immediately.

Stuart decided on the second course of action.

Stuart's judgment was correct, for the Federal General, Cooke, had assembled not only cavalry but infantry at Hanover Court House. Cooke, however, misled by erroneous reports, and mystified by Stuart's superior strategy did not hotly pursue but halted for the night at Old Church.

In the meantime the raiders had moved forward rapidly. The vanguard, once more under command of W. T. Robins, had orders to halt at the road along which the telegraph ran and cut the wires, thence to push forward and attack, without waiting for support, the company of Federal Infantry at Tunstall's Station on the York River Railway, McClellan's main line of communication with his base at Yorktown. An ordnance wagon, heavily loaded with canteens and Colts revolvers, was captured on the telegraph road. Prisoners were picked up all the way, but the advance was so rapid that no adequate warning reached Tunstall's Station.

The station with its guard was captured hardly without a shot being fired. Shortly afterwards the main body arrived, and in spite of attempted blocking of the line, by placing timber on it, a train load of troops managed to drive through the station. A number of casualties were, however, sustained by the troops in it, for the Confederates promptly opened fire as it passed through. Before leaving the station, rails were torn up, large quantities of stores were destroyed, the railway bridge was burnt, and the raiders filled themselves with the many good things in the sutlers establishments.

In the meantime the advance guard had reached Baltimore Store, where they also made themselves free of the food and drinks found in the shop of an enterprising Yankee sutler.

Two squadrons were despatched from Tunstall's Station to Garlick's Landing on the Pamunkey River (not shown on the map). They also were successful and returned with a large number of prisoners, horses and mules, having set fire to two transports.

It was now a beautiful moonlight night and Stuart moved to Talleyville, eight miles east of Tunstall's Station, where he halted for three hours to rest his men and horses.

Shortly after midnight he turned off on a country road to the Chickahominy River and arrived at Forge Bridge at dawn. The bridge was broken and the river had overflowed its banks. This did

not daunt the Confederates, for Colonel Fitz Lee, accompanied by a few men, swam the river. General Stuart had in the meantime managed to repair the broken-down bridge thus getting his two guns and transport over. As soon as all had crossed, the bridge was burnt.

By one o'clock the whole force was across the river, but they were by no means out of the wood, for they were still some thirty-six miles from Richmond and in rear of the left flank of the enemy.

They were unmolested, however, and by sunset had reached Charles City Court House. From here Stuart rode ahead to report to Lee, his squadrons following at midnight. He himself reached Headquarters before dawn on June 15th, having ridden thirty-five miles on a road patrolled by Federal troopers!

Later in the morning his own troops arrived tired but triumphant, bringing with them 165 prisoners and 260 horses and mules. Colonel Henderson in his "Stonewall Jackson" says: "This extraordinary expedition, which not only effected the destruction of a large amount of Federal property, and broke up, for the time being, their line of supplies, but acquired information of the utmost value, and shook the confidence of the north in McClellan's generalship, was accomplished with the loss of one man. These young Virginia soldiers marched one hundred and ten miles in less than two days. 'There was something sublime,' says Stuart in his report, 'in the implicit confidence and unquestioning trust of the rank and file in a leader guiding them straight, apparently, into the very jaws of the enemy, every step appearing to them to diminish the hope of extrication.' Nor was the influence of their achievement on the morale of the whole Confederate Army the least important result attained. A host of over a hundred thousand men, which had allowed a few squadrons to ride completely round it, by roads which were within hearing of its bugles, was no longer considered a formidable foe."

This sums up in short the results of Stuart's great achievement, which will go down for all times in history as one of the most magnificent operations carried out in the American Civil War, which abounds in gallant exploits.

Of Stuart, Colonel Henderson writes, "... He brought to the great struggle upon which he had now entered a thorough knowledge of arms, a bold and fertile conception, and a constitution of body which enabled him to bear up against fatigue which would have prostrated the strength of other men. . . . His animal spirits were unconquerable, his gaiety and humour unfailing; he had a jest for all and made the forests ring with his songs as he marched at the head of his column. . . . When General Johnston was transferred to the West he wrote to Stuart: 'How can I eat, sleep, or rest in peace without you upon the outpost?' . . . The dashing horseman

of eight and twenty, who rivalled Murat in his fondness for gay colours, and to all appearance looked upon war as a delightful frolic, held a rule of life as strict as that of his presbyterian comrade (' Stonewall ' Jackson); and outwardly a sharp contrast, inwardly they were in closest sympathy."

This story has been largely taken from Colonel Henderson's " Stonewall Jackson," and " Battles and Leaders of the Civil War," edited by R. U. Johnson and C. C. Buel.

R.A.F. CRUISES

Cruise by No. 202 (Flying Boat) Squadron to Egypt and the Sudan

FOUR Fairey IIIF. floatplanes, each fitted with a Napier Lion engine, belonging to No. 202 (Flying Boat) Squadron, carried out a cruise during June and July, calling at the following places :—

Leaving Malta on June 20th, the Squadron flew via Augusta, Corfu, Athens, Kastellorizo, Famagusta and Beirut, reaching Aboukir on June 23rd.

The Squadron left Aboukir on the 25th, and, after calling at Luxor, Wadi Halfa, Merowe and Atbara, arrived at Khartoum on the 29th, having been delayed by bad weather.

The four floatplanes left Khartoum on July 2nd, and, although delayed by slight radiator trouble at Atbara, they arrived at Aboukir on the 5th via the route adopted on the outward journey.

Leaving Aboukir on July 12th, the Squadron returned to Malta via Lake Timsah, Famagusta, Kastellorizo, Athens and Corfu. It was originally intended to return via Mirabella, but it was decided not to call at this place, as unfavourable weather reports were received.

The Squadron was commanded by Squadron-Leader H. W. Evens, and the distance flown was about 6,190 miles.

Royal Air Force East African Cruise, 1932

A report of the East African cruise, made in the early part of this year, has now been received and furnishes much interesting information. Some interesting points in the report are given below :—

FLYING CONDITIONS.

Four Fairey IIIF. aircraft of No. 14 (B.) Squadron, Amman, were engaged in the cruise and flew an average distance each of over 18,200 miles.

The cruise entered the area of heavy rains on more than one occasion and, whilst there is no doubt that the African thunderstorm can present a most forbidding appearance, yet, apart from the dangers due to the clouds meeting the high ground, which are accentuated in East Africa

by the fact that the maps are extremely unreliable, it was not found that the local weather conditions were in any way more severe than those experienced in other parts of the world by the Royal Air Force.

The majority of the country flown over was thick bush or cedar forest, where not only would a crash be the inevitable result of a forced landing, but the personnel involved would have some considerable trouble in making their way to civilization, and the actual rescue work of injured personnel would be fraught with grave difficulties.

Very serious magnetic disturbances in certain parts of the territories had the effect in some cases of throwing out the compasses by as much as 32 degrees' variation, and were due presumably to the immense formations of ironstone, especially in the neighbourhood of the Great Rift Valley.

FLIGHTS WITH LOCAL ADMINISTRATIVE OFFICERS.

Every effort was made at each stopping-place to take the local administrative officers and other Government officials over the districts for which they were responsible.

Some seventy-five Government officials were thus transported, and expressed themselves enthusiastically on the effect upon the native mentality of the formation flying of Service aircraft.

In Tanganyika especially several of the senior officials stated that the natives were quite fixed in their opinion that the British had won the war in East Africa because of the N'dege (birds). They said that the natives were visibly impressed by the visit of the aircraft, and that the cruise had made matters considerably easier for them in their districts.

KENYA.

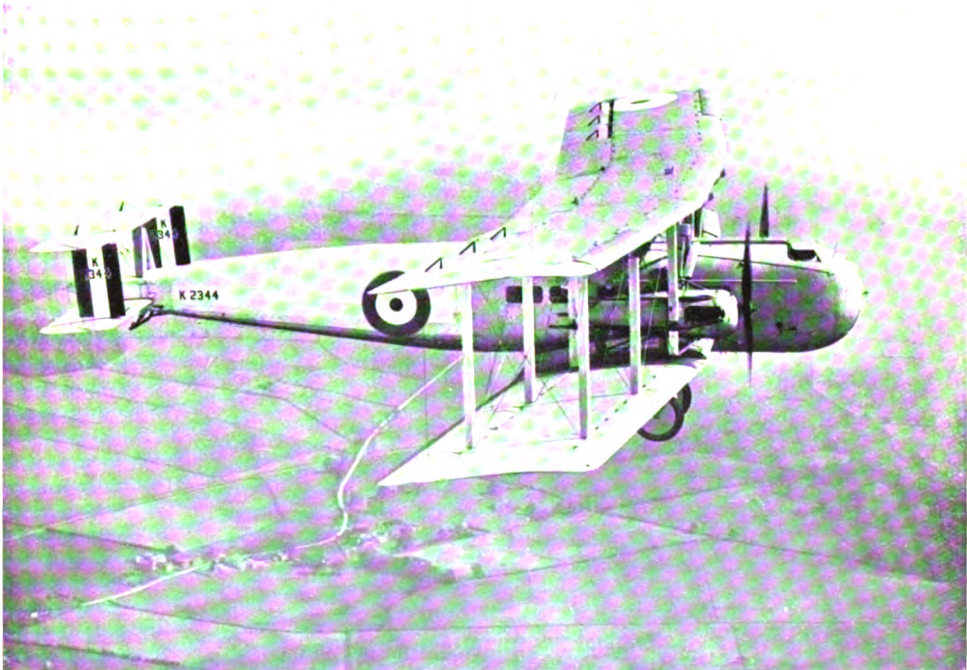
As a result of one flight over the coastal district of Mombasa, a locust officer was enabled to get an adequate idea of the degree of infestation in his area, and in consequence was able to release two subordinate locust officers for work elsewhere, where their services were urgently required. By no other means could he have surveyed the district, which is chiefly waterless bush country. A distance of 550 miles was covered by this flight in 4 hrs. 40 min.

A project had been mooted to construct a road from Kitui, which is some eighty miles east of Nairobi, to Malindi, which is the same distance north of Mombasa on the coast-line. This route traverses a most inhospitable bush country, and the possibilities of the route, lacking air reconnaissance, could only have been determined by running an expensive safari, which would have taken months to inspect the route and locate water supplies. The Provincial Commissioner and the Public Works Committee road expert were flown across the

FLYING BY INSTRUMENTS.



INTERIOR VIEW OF VICKERS "VICTORIA " TROOP CARRIER, SHOWING CREW FLYING BY INSTRUMENTS ONLY.



A VIEW SHOWING THE VICKERS "VICTORIA " IN FLIGHT, THE MACHINE BEING FLOWN "BLIND," AS THE PILOTLESS COCKPIT SHOWS.

area in question, arriving back at Nairobi the same evening. The reconnaissance showed the impracticability of constructing the road by this route, owing to the lack of any water supply.

The Provincial Commissioner of the Masai Reserve and his District Commissioner from Narok, in consequence of a flight over the Masai Reserve, were enabled to locate in a clearance in the Mau Forest native squatters with herds of cattle, which in any event should not have been there and which were probably stolen. The information obtained on this flight enabled the local officials to put in train the necessary investigations.

The Provincial Commissioner at Eldoret was enabled, by means of a flight over the mountainous Marakwet area, to see that the project under consideration for the construction of a road round that district was impracticable. This official stated that only by many weeks of difficult personal safari and at considerable expense could he have obtained this necessary information.

One aircraft carrying the District Commissioner of Eldoret was dispatched to demonstrate over a local meeting of witch-doctors who had been giving a considerable amount of trouble. They were informed that many such aircraft were available when required for dealing with people who disobeyed the Government. This demonstration had a salutary effect.

At the request of the Governor of Kenya, an air survey was undertaken of the north-eastern frontier of the province. The frontier had been demarcated some years ago by an international commission, and during that survey a track many hundreds of miles in length was cut through the bush to mark it. The local Commissioner had requested a large sum of money for the purpose of recutting this track. The greater part of the expense involved in such operations would be on account of transport, as the frontier runs for hundreds of miles through waterless and inhospitable bush. The Government of Kenya, unwilling to grant the necessary funds unless such a course was inevitable, asked for an air reconnaissance to determine whether or not the track was still visible. The aircraft had no difficulty in following the track throughout most of its length, and established that only in one part, namely, near the frontier part of Mandera, was it in a really bad condition.

In consequence of the reconnaissance, the Government were placed in a position to postpone expenditure running into many thousands of pounds for at least some years.

TANGANYIKA.

The district on the slopes of Kilimanjaro was evincing considerable truculence with regard to the construction of a water-furrow required

for the service of the population lower down the mountain. A demonstration was made over the area affected, the Provincial and District Commissioners being carried in the aircraft. An immediate alteration in the temper of the district resulted, and it was reported later that the construction of the water-furrow was proceeding without further trouble.

A demonstration was staged over a village near Tenga which had been giving trouble, and it is understood that the effect of this demonstration was also satisfactory.

UGANDA.

Information was received from the District Officer at M'Bale that he anticipated serious trouble in the district north of Mount Elgon, owing to the infiltration of the cattle and herdsmen of a neighbouring tribe who were unable to find pasture in their own district. The local natives resented this intrusion, firstly because of the deprivation of pasture required for their own cattle, and secondly owing to the possibility of cattle diseases being spread amongst their own herds. Two aircraft were sent over the district on the same day, carrying the Provincial Commissioner, who was consequently enabled to form his own idea of the situation and to take immediate steps to deal with the matter.

During the cruise, particular efforts were made to arrive at the various destinations punctually according to the programme already arranged. This evoked very favourable comments, both from residents and from the local Press, and did much to dispel the bad impression which had been created by civil air services serving the district. Owing to their persistent failure to arrive at scheduled time, the opinion had been formed that aircraft were useless as a means of travel when appointments had to be kept. During the whole cruise of over 18,000 miles, the flight was in only one case late, arriving at all other places on scheduled time.

LANDING-GROUNDS.

Photographs of every landing-ground visited during the cruise were taken. Generally speaking, the landing-grounds were in an exceptionally good condition, considering the state of aviation in this part of the world, which reflects great credit on the Governments concerned.

GAME.

Practically every known type of game was seen from the air during the cruise, and some interesting tests were carried out to illustrate the effect of aircraft on game at certain heights. Complaints had recently been made regarding the bad effect on game preserves of the low flying of airmen in East Africa. In consequence of the tests carried out, the conclusion was reached that the stampede produced amongst game

by aeroplanes flying comparatively high lasted longer than that caused by flying low. The tests served to dispel some ill-feeling which had been engendered in the Press on this subject, in which the effect of flying on game had been grossly exaggerated.

CO-OPERATION WITH THE LOCAL FORCES.

An extensive programme of co-operation with the local forces in the territories was carried out during the cruise.

Demonstrations were given before the King's Own Rifles at Bombo, Nairobi, Dar-es-Salaam and Tabor, and with the Kenya Defence Force at Nairobi and Mombasa.

In other places, such as Zanzibar, where military forces were not resident, demonstrations and lectures were given to the local police.

Co-operation in most cases was carried out smoothly and with the greatest ease.

THE ARMAMENT OF SINGLE-SEATER FIGHTERS

BY WING-COMMANDER J. O. ANDREWS, D.S.O., M.C., *p.s.a.*

THE importance of the time factor in the interception of bombers by fighters is generally recognized and stressed whenever defensive operations are under consideration. But the importance of quickly destroying enemy aircraft after contact has been made is far less frequently emphasized, although the desirability both of destroying the maximum number of bombers before their objective is reached, and of inflicting the maximum damage upon a formation before contact is lost are obvious. To fulfil the first requirement, that the time taken to intercept shall be as short as possible, it is essential that the fighter should possess a high performance. To meet the second requirement of certain quick destruction a powerful armament is essential.

These are conflicting requirements. If armament is increased down comes performance. However, despite the apparent stability in the weapons of single-seater fighters, in which there has been virtually no change since 1917, we may doubt whether an armament of two synchronized Vickers guns constitutes the best compromise.

One peculiarity of air fighting is the comparative immunity, reminiscent of South American revolutions, which the combatants enjoy although in full view of each other. The poor standard of accuracy of air firing as compared with that of ground firing is due partly to the high velocity of the target with consequent big deflection allowances, and partly to the large and sparsely filled patterns caused by the difficulty of maintaining the firing aircraft in steady flight, and by the dispersal of the bullets owing to vibration of the aircraft. Even pilots of great fighting experience found that, with the standard two-gun armament, they were not certain of destroying an enemy aircraft unless the range was very close, one hundred yards or less. The necessity for almost hand-to-hand fighting favours the aircraft attacked, since the shorter the effective range the greater is the time interval, after interception, before fire can profitably be opened, and should the single-seater fighters make contact below the level of the enemy aircraft it may be impossible to close to within effective range.

The large patterns characteristic of air firing are, up to a point, desirable as counteracting the aiming difficulty of placing the pattern in the right place, but as the vital target is small—the pilot, engine and tanks—it is essential that the pattern should be closely filled,

and the effective range cannot be increased to favour the fighters unless the pattern is more closely filled than at present. The density of the pattern is dependent upon the number of guns carried and their rate of fire. Research has for many years been devoted to speeding up the present types of guns and no appreciable improvement can be expected. An increased bullet density can, therefore, only be secured by increasing the number of guns carried, to the detriment of performance, unless a corresponding reduction in load and drag can be made.

It is desirable for many reasons, both technical and tactical, to dispense with the C.C. Gear. If this were feasible a weight approximately equivalent to that of one gun would be available, and the extra gun that could be installed in place of the gear would increase the bullet density by 50 per cent. But the removal of the interrupter gear would necessitate placing the guns beyond the airscrew disc and out of reach of the pilot. The increased fire density would thus only be realized in practice if the proper functioning of the guns without the pilot's assistance could be guaranteed. One cannot feel confident that the necessary high degree of reliability is now realised under peace conditions with most careful manufacture of gun and ammunition, good maintenance and low-firing altitudes. In war, mass production, a lowered standard of maintenance and the much more exacting conditions which will be met in air fighting at high altitudes make the expectation of adequate freedom from stoppages quite unjustified.

If the present system of installing guns in the cockpit within reach of the pilot must remain, we must look elsewhere than to the C.C. Gear to effect the saving in weight necessary to allow further guns to be carried. The equipment of service aircraft is continually under review to determine where weight can be reduced by re-design or by the deletion of superfluous equipment, nevertheless the growth in the number of accessories carried outweighs any savings effected, and the tendency is for the weight of the military equipment to increase.

It thus appears impracticable with the present type of gun to improve the fire power of the single-seater fighter, since no appreciable increase in the rate of fire can be expected and there is no likelihood of our being able to add guns without an unacceptable reduction in the performance of the aircraft. We are, therefore, led to a criticism of the gun itself.

The Vickers gun in aircraft was not designed specifically for air use but was adapted from a ground-gun, any type of which must be self-contained and provide its own motive power. With the Vickers the recoil forces are utilized to operate the gun, and these are of limited magnitude, hence the number of stoppages due to the failure to overcome frictional forces which, with a cold gun, are very large. Thus one important attribute of an air-gun must be ample power to

operate the moving parts in the most adverse circumstances. An air-gun has the advantage over the ground-gun that there is no necessity for it to be self-contained. An abundance of engine power is available, and some of it can be utilized to drive a mechanically operated gun. With a positive drive it should be possible to overcome friction with a large margin of power to spare, and, incidentally, to dispense with the high standard precision work now necessary in certain portions of the Vickers gun. Would the weight of the mechanical gun and drive exceed that of the present Vickers gun? Could speeds of firing be reached which would make one mechanical gun do the work of, say, two recoil operated guns? The answers to these and similar pertinent questions can only be arrived at by experiment.

The serious limitations of the present standard armament of single-seater fighters are not apparent to pilots without actual war experience, because the air-firing exercises in peace do not reproduce the conditions of real air fighting. Aircraft performance, the efficacy of bomb-sights and other items of equipment can readily be ascertained in peace. Comparison is simple, and when the necessity obviously arises endeavour can be made to accelerate progress. But this does not hold for single-seater fighter armament, and probably accounts for the relative stagnation in weapons for air fighting. The perfection of the single-seater fighter is, however, of greater importance to ourselves than to any other country, and a mechanically operated gun opens up the possibility of marked improvement in efficacy, which is denied us so long as we adhere to the present armament composed of guns designed for ground use.

IS A SPECIAL TYPE OF LOW-FLYING UNIT NECESSARY?

FLIGHT-LIEUTENANT W. M. YOOL, *p.s.a.*

CERTAIN foreign countries, and notably the United States, have definitely allocated part of their air forces to what are commonly known as "ground attack" duties. That is to say that certain units are specifically trained for carrying out low-flying attacks in co-operation with the Army on objectives in furtherance of the aim of the Army Commander, under whose orders the units operate. These low-flying attacks include machine-gunning and bombing attacks upon such objectives as massed bodies of troops, transport columns, tanks, troop trains, etc., and the laying of smoke screens, whilst the aircraft used may be either single-seaters or two-seaters, and may be either a standard type of aircraft already used for other purposes, such as single-seater fighters or army co-operation aircraft, or they may be of a special type designed primarily for ground attack duties.

In view of the growth of this policy abroad, and the fact that several articles have appeared of late in both the British and Foreign Press in which the value has been stressed of such low-flying attacks in support of operations by ground forces, and which have supported the view that special air units should be provided and trained for this specific duty, it is proposed in this article to discuss whether it is, in fact, sound policy to allocate a portion of one's air forces to this particular duty, and to consider the problem mainly from the point of view of a major war, in which the opponents would probably possess powerful and approximately equal air forces.

The main arguments put forward in favour of having special ground attack units are :—

- (i) Low-flying attacks against suitable objectives are of great value in direct support of military operations.
- (ii) To obtain the greatest value from such attacks, the units carrying them out must be specially trained for the purpose, and must operate under the immediate command of the army commanders concerned.
- (iii) The value to be obtained from such attacks is so great that it justifies a diversion of a proportion of the air strength of a country to this duty.
- (iv) To obtain the best results from low-flying attacks, units must not only be specially trained but they must be equipped with a special type of aircraft.

Before commencing to deal with these arguments, it can be stated immediately that there is no intention of attempting to minimize the value of low-flying attacks on suitable objectives in support of operations by the Army, of which there were abundant examples in the late war, the most notable being the air attacks on the retreating Turkish forces in Palestine in 1918. The moral and material value of such attacks is considerable, and there is no doubt that aircraft employed in this manner can at times be of great assistance to the troops with which they are co-operating.

It is considered, however, that the occasions upon which the use of aircraft for this purpose would be justified are comparatively rare, and that normally, in a major war, not only the immediate aim of the ground forces, but the higher aim of the operations as a whole, would be furthered more effectively by employing all the available fighter aircraft on preventing the enemy air force carrying out an air offensive; denying him air observation by preventing his reconnaissance aircraft from operating; and ensuring adequate air observation for our own forces by preventing the enemy fighter aircraft from interfering with our army co-operation aircraft, whilst the bombing aircraft will be best employed upon an offensive against the enemy in furtherance of the plan of the particular campaign in which they are engaged.

The same principles hold good whether the air forces are operating in a primary rôle or in a secondary rôle in support of military operations, and to allot permanently a proportion of the aircraft available to the definite duty of carrying out low-flying attacks to afford direct assistance to the operations being undertaken by an Army, especially when opposed to an enemy possessing a powerful air force, will almost certainly react unfavourably, not only on the operations as a whole but on the army in addition, as insufficient protection will be afforded to the army co-operation aircraft, and the effectiveness of the enemy's bombing offensive will be increased in proportion to the number of fighter aircraft which are withdrawn from their correct function of endeavouring to secure air superiority.

Where the enemy air forces are markedly inferior, or in a war against undeveloped or semi-civilized countries possessing no air forces, the best method of employing the aircraft available may sometimes be to use them in direct support of the operations being undertaken by the army, though even in these instances it will often be the case that the aircraft can be most effectively employed on the attack of objectives, such as vital centres of production, which are outside the immediate zone of the military operations, and the successful attack on which may have more valuable results than would be attained by direct attack upon the enemy's military forces in the field.

There is another type of low-flying attack which has not so far

been dealt with and that is low-flying attacks on objectives in furtherance of the air aim. If, for example, it had been decided to employ the air forces in attacks upon enemy aerodromes, low-flying aircraft would almost certainly form part of the attacking force, and similarly low-bombing attacks will frequently have to be employed in order to make certain of hitting an objective of small area, such as a lock-gate or railway bridge, the destruction of which was considered essential.

The tactical methods to be used in attacks of this description differ little, if at all, from the methods which would be used in attacks in direct support of operations by an Army, and it therefore appears logical to suppose that if special units are to be allocated to, and trained for, low-flying attacks in support of ground forces, similar units will equally be required for these duties in support of air operations.

That there is no difficulty in providing the necessary tactical training for low-flying attacks for units normally engaged in other duties is proved by the success of the low-flying attacks, carried out from time to time by our general purpose squadrons overseas during the course of the various operations in which they have been engaged, by the attacks on tanks by fighter aircraft which are such popular items at the Air Display each year, and by the marked success attained by many such attacks during the late war without any special preliminary training.

It is considered, therefore, that, as units can be easily diverted from their normal duties to carry out low-flying attacks, and can undertake such attacks efficiently without any highly specialized training, there is no necessity to provide special units for the purpose, as the existing type of fighter can easily be diverted, if necessary, from its normal duty.

Turning now to the consideration of whether a special type of ground attack aircraft is required, the answer really depends upon whether or not it is admitted that special low-flying units are necessary.

If a special type was not provided, the aircraft which would normally be used for low-flying attacks would be fighters, either single or two-seater, although on occasion day bombing or army co-operation aircraft might be used, although the latter would be handicapped in comparison to the fighter owing to the fact that low-flying aircraft, unless armoured, must rely mainly on attaining surprise, and on their speed and manoeuvrability for protection from fire from the ground. Such aircraft would probably be less efficient than a type specially designed for the purpose, and it is admitted that if special units are provided, then they would undoubtedly be more efficient if equipped with a special type of aircraft. It is not proposed to discuss here in detail what type the aircraft should be, but suggestions for the design of a

special type of aircraft for low-flying attack include such things as armour for the protection of the crew and the vital parts of the aircraft, having fixed guns inclined downwards from the line of flight so that a single-seater, instead of having to dive on to the target in order to bring its guns to bear, would be able to fly level along such targets as a trench or column of troops, or the production of the armoured autogyro type suggested in an article in the May, 1932, issue of the *R.U.S.I. Journal*.*

The great reduction in performance caused by the fitting of armour would cause aircraft so fitted to be unsuited for any other employment, and similar objections apply also to aircraft fitted with fixed guns inclined downwards or to the autogyro type.

It is considered, therefore, that it will be generally agreed that if a special type of aircraft is produced for carrying out low-flying attacks, such aircraft will be definitely unsuitable for any other form of air operations, an objection which applies to practically no other type of aircraft designed for use in war, and that it would be unsound to provide such a type unless the provision of special low-flying units had been definitely decided upon as desirable.

Finally, to sum up the conclusions which it is desired to reach in this article :—

- (i) It is admitted that low-flying attacks against suitable objectives can be of great value in support of operations by ground forces.
- (ii) The occasions upon which aircraft can be best employed in this manner are, however, comparatively rare, especially in a major war.
- (iii) Fighter aircraft, which, apart from the provision of a special type for the purpose, are the most suitable type for low-flying attacks owing to their high speed and manoeuvrability, can usually assist an army most effectively by ensuring it freedom from enemy air interference, and by protecting their own army co-operation aircraft.
- (iv) If such attacks should be required in war no highly specialized form of tactical training is required, and units can at any time be diverted from their normal rôle to that of low-flying attacks.
- (v) A specially designed aircraft would probably be able to carry out such attacks more efficiently, but if a special type of aircraft was produced the disadvantage of their being definitely unsuitable for any other form of employment is considered to more than outweigh the possible advantages to be gained.

* A Tank of the Future, by L.V.S.B.

- (vi) It is considered that it is a mistaken policy to allot a proportion of the air forces available definitely to the rôle of ground attack in peace time when the possible developments of a future war cannot be foreseen, and that it is better to retain an elastic organization whereby the fighter squadrons can be employed in whatever manner appears best suited to the particular campaign in which they are engaged.
 - (vii) This article has been written mainly with a view to a major war, in which both sides would probably possess powerful air forces, in which it is considered that the attainment of air superiority would be the primary rôle of the fighter aircraft, and in which it would not be possible to afford the diversion of effort which would be required to provide low-flying attacks in direct support of military operations.
 - (viii) Even if the opposing air forces are markedly inferior or non-existent, however, it will usually be more advantageous to use any superiority in aircraft to strengthen the scale of attack upon vital objectives outside the zone of the military operations, rather than to attack the enemy's forces in the field directly.
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FUEL ECONOMY AND THE PILOT

BY A. E. WOODWARD NUTT, B.A., A.F.R.Ae.S.

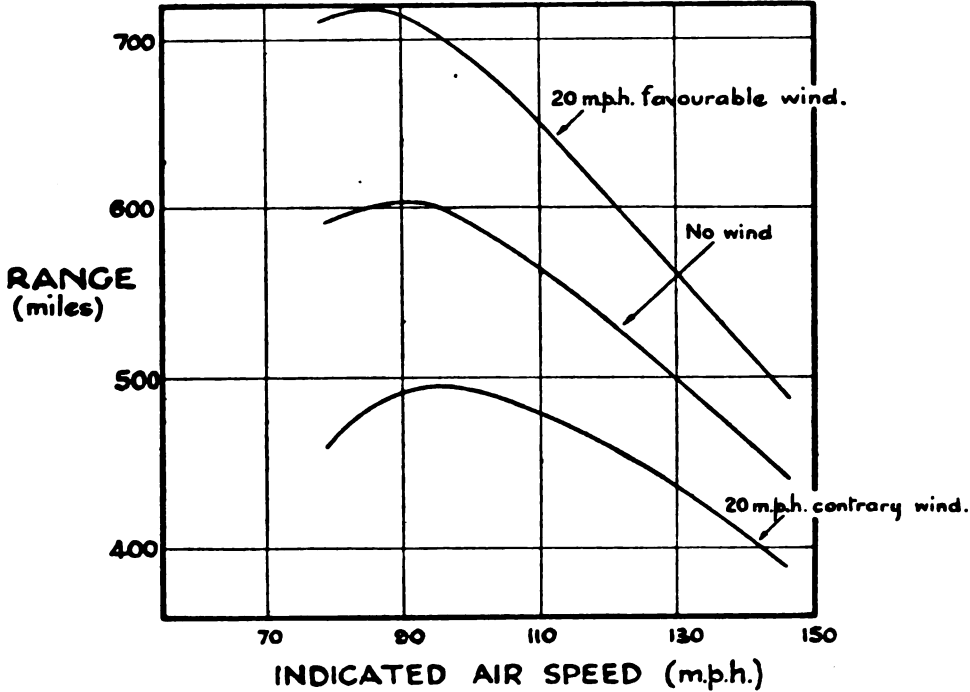
ECONOMY is a virtue much sought after at the present time, but it is one of those rather negative virtues about which it is difficult to be enthusiastic. When thinking in terms of aircraft, however, the negative virtue of economy may be translated into the very positive virtue of range, and to a pilot the operational range of his aircraft may be on occasion a matter of very vital importance. For this reason, therefore, it may be interesting as well as opportune to discuss some of the reasons for the high fuel consumptions so often obtained with the engines in aircraft, and to see to what extent the remedy lies in the hands of the pilot.

During the discussion following a recent lecture before the Royal Aeronautical Society on some of the factors affecting the range of aircraft, one of the speakers, a pilot in the Royal Air Force, told a story which illustrates graphically the importance of fuel economy. A certain pilot of his acquaintance had been flying for some time in a single-seater landplane over an unbroken cloud layer, and apparently had been a little careless about his direction, for on descending through the clouds, he found that he was over the sea, out of sight of land. He knew that he was short of fuel, so realizing that he was over the North Sea, he flew in a westerly direction at full throttle. Fortunately he just managed to cross the coastline before his fuel supply ran out, but in making a forced landing he damaged the aircraft considerably.

The implication from this story is, of course, that the damage to the aircraft, and the pilot's own narrow escape from drowning were due to his ignorance of the effect of speed on fuel consumption. Had he flown with his engine well throttled back, it would certainly have taken him longer to reach the coast, but the range of the aircraft would have been so much greater at the lower speed that he would probably have been able to have got back safely to his aerodrome.

This incident occurred some years ago, and is probably exceptional, but there is no doubt that many pilots do not realize how low is the most economical speed of an aircraft, or how large a gain in range is obtained by flying at or near this speed under still air conditions. The point may perhaps be most easily appreciated by referring to the curves shown on the opposite page, the shape of which is typical :

RANGE CURVES
FOR
TWO-SEATER FIGHTER AIRCRAFT
AT 12,000 FT.



It will be seen from the middle curve that for the aircraft concerned a range of over 600 miles is attained at an indicated air speed of 90 m.p.h. in still air, whereas at full throttle ($V_i = 145$ m.p.h.) the range is approximately 450 miles only. The other two curves show how large is the effect of wind on the range at all speeds, and also that moderate winds do not make much difference to the most economical speed. In the example shown, a 20-m.p.h. wind increases or decreases the maximum range by over 100 miles, but the most economical speed only changes some 5 m.p.h. in either direction. The most economical speed in still air is the same at all heights, and if the engine of the aircraft is supplied with a suitable strength of mixture at all heights the range at any indicated air speed does not vary appreciably with height. It is not proposed to go farther into this aspect of range here, as this article is concerned more with the economical operation of the engine, but enough has been said to emphasize the importance of flying the aircraft at or near its most economical speed if fuel is to

be saved and long range attained. Let us now turn to the engine side of the question, which unfortunately is not quite so straightforward.

There is no doubt whatever that most of the engines in aircraft to-day are operated normally under uneconomical conditions. This statement may sound somewhat sweeping, but it is nevertheless true. Considerable developments in the direction of economy have been made, especially during the past two years, but there is still ample room for further improvement.

For the economical running of a present-day engine in an aircraft two things are necessary: first, the suitable design of the engine, particularly as regards the carburettor, so that a suitable mixture strength is supplied at all throttle openings, and, secondly, the intelligent operation of the aircraft and engine by the pilot. These two things are to some extent interdependent in their effect upon fuel consumption, for the pilot can do much to correct for the imperfections of the engine, and it might perhaps be said that an engine should be so designed as to be unaffected by the imperfections of the pilot. Be this as it may, under the present conditions both must share the blame for extravagance.

It is logical perhaps to deal first with the engine, as the pilot has to take what engine is provided and is expected to make the best of it. Until quite recently the tendency has been to design the carburettors of aircraft engines primarily for power and acceleration, economy being very much a secondary consideration. It so happens that an engine gives its maximum power at a mixture strength appreciably greater than that necessary for complete combustion of the fuel, *i.e.*, with a mixture appreciably richer than the "correct" mixture. Moreover, there is only a very small drop of power from the maximum over a very wide range of mixture strengths on the rich side. Rich mixtures are known to give cooler cylinder conditions, and hence the tendency, when designing for maximum power, has been to provide rich mixtures, with consequent high fuel consumptions. Consumptions were measured during acceptance tests at nine-tenths of full power only, and therefore some attempt was made to get low consumption here, usually at the expense of extravagance at other throttle openings.

In an aircraft maximum power is required mainly for take-off and for quick climbing. In addition, good acceleration is an essential, and this, like maximum power, requires a rather rich mixture. These conditions, however, represent a very small proportion of the total running time of an engine, the bulk of it being occupied by working under throttled conditions. What is really required from a carburettor, therefore, is a rather rich mixture at full throttle, in order to give maximum power, and an appreciably weaker mixture when the engine

is well throttled. At the same time, a rich mixture must be available when required for sudden acceleration, and there must be no question of the engine "cutting out" when the throttle is rapidly opened. Distinct advances have been made in carburettor design in this direction in recent years. In some modern carburettors the main jet system is designed primarily for economy and an additional or "power" jet comes into action near full throttle, good acceleration being obtained by means of a small pump attached to the throttle control which squirts in a small quantity of petrol when the throttle is suddenly opened, thus temporarily enriching the mixture. Complete automaticity has not yet been achieved, however, and the result is that, to ensure that power will always be available when required the mixture is in general richer than is really necessary.

With modern high-compression engines, although the high-compression ratio in itself is a factor causing economy in fuel consumption, it is usual to tune the carburettors to supply a mixture from 20 to 30 per cent. rich at large throttle openings, with the object of suppressing detonation. At smaller throttle openings the mixture is usually of the order of 10 per cent. rich.

Carburettors, therefore, being tuned to give relatively rich mixtures, in order to get economy under cruising conditions the mixture has to be weakened artificially by some external device. Hence the provision in aircraft of the so-called "altitude control." This brings us to the pilot's side of the question, and it is perhaps as well to state at once that the economical running of the engine, and hence the operational range of an aircraft, depends within very wide limits on the skill and care with which this control is operated.

The term "altitude control" is really a misnomer, as it is merely a means of weakening the mixture supplied to the engine and can be used with advantage at any altitude. The control gained its name because it was originally fitted to correct the tendency of the mixture to become rich as the atmospheric density decreased with increase of altitude, and the name has been largely responsible for a general reluctance on the part of pilots to use it except at great heights. Until quite recently few pilots would think of using "altitude control" below a height of 5,000 feet. There is a tendency for the term "mixture control" to displace "altitude control," and as it is a far more suitable term, it will be used throughout the present article.*

Another reason for the disinclination to use mixture control is that the pilot has no indication whatever that his operation of the control is having any beneficial effect. The only one of his instruments which can tell him anything is the R.P.M. indicator. This is a very

* Since the above was written it has been officially decided that "altitude control" will be referred to as "mixture control" in all correspondence and reports.

insensitive measure for the present purpose, for what the pilot is interested in is the power of the engine, and in level flight this depends on the cube or some higher power of the R.P.M. Moreover, when the initial mixture is rich, as already mentioned, a considerable weakening may be made before any appreciable change in the power occurs. In addition to its insensitivity to changes of power, fluctuations of the R.P.M. indicator continually occur owing to irregularities in the drive, bumps, or a slight divergence from level flight, so that it is not always easy for a pilot to be sure as to what any change in the R.P.M. is due. Further, all he can hope for is an indication of a *loss* of power due to excessive weakening of the mixture, and a pilot very naturally likes to feel that an engine is giving the maximum power possible under any given conditions, and so is chary of using any control which may reduce the power.

In addition to this, many pilots still have a rather hazy idea that it will be bad for the engine if they use their mixture controls otherwise than very sparingly. They have heard stories of serious overheating of engines, resulting in burnt valves and other troubles, and said to be caused by running engines on weak mixtures. In consequence, they do not use their mixture controls to anything like a sufficient extent. The question of the effect of weak mixtures on engines is somewhat involved and somewhat controversial, and it is not proposed to discuss it at length here. Suffice it to say that in the past the harmful effects of weakening the mixture supplied to an engine have been very much exaggerated, and that engines can be run with perfect safety on mixtures appreciably weaker than those at present in general use. As far as the effect on fuel economy is concerned, it is safe to say that by more generous use of the mixture control on most present-day aircraft, reductions in consumption of the order of 10 per cent. could be obtained with no ill-effects whatever.

In this connection, it is worthy of note that the use of mixture control is encouraged by the present Royal Air Force regulations. Since August, 1931, pilots have been encouraged to use their mixture controls to an extent that will cause a drop of 20 R.P.M. in level flight, when the throttle is less than three-quarters open. The use of this amount of mixture control causes a very considerable reduction in the fuel consumption of an engine under cruising conditions, with a corresponding improvement in the operational range of the aircraft in which it is installed. It is probable that further use of the mixture control will be permissible when more data on the effects of the prolonged running of engines on weak mixtures have been obtained.

The author was recently in conversation with the chief test pilot of an aircraft firm, who had been very much impressed by the effect of the mixture control on the range of an aircraft he had been demon-

strating abroad. When flying in foreign countries he had to pay in cash for petrol at aerodromes, and in consequence his attention was drawn forcibly to the fuel consumption. He had also found on occasion that the increase in the range of the aircraft due to careful use of the mixture control enabled him to fly right over some country *en route*, and so avoid landings to clear Customs, thus saving appreciable time and trouble.

The effect of mixture control on fuel consumption is also very strikingly demonstrated when aircraft are fitted with flowmeters which give an instantaneous indication of the amount of fuel passing through the engine. When a pilot flies for the first time an aircraft fitted with a flowmeter he is invariably impressed by the large changes in flow caused by a small movement of the mixture control in level flight, with no apparent effect on the running of the engine. Some years ago some consumption measurements were made on aircraft in a bomber squadron during formation flights at moderate altitudes. When the pilots were given no special instructions as to the use of their mixture controls, the fuel consumptions were high, and variations in consumption between different aircraft in the same formation of over 40 per cent. occurred. When further tests were made with flowmeters fitted, and the pilots told to use their mixture controls and to fly as economically as possible, the variation between aircraft in a formation was reduced to about 6 per cent., and the reduction in the average fuel consumption was equivalent to an increase of the order of 50 per cent. in the operational range of the aircraft. The fitting of flowmeters in all aircraft is neither practicable nor necessarily desirable, but the above examples show that intelligent use of mixture control in itself results in very appreciable economies.

At the present time the pilot does not have an entirely free hand in the economical running of his engine, for it is customary to limit the movement of the mixture control lever in an aircraft by interconnecting it with the throttle, so that the position of the throttle determines the amount of mixture control that can be applied. This was originally done to ensure that the throttle and mixture control levers moved back together, in order to prevent the engine "cutting out" if the throttle was opened quickly after a long glide. With many modern engines, particularly supercharged ones, this reason no longer exists, as tests have shown that the engines actually open out better if the mixture control is left open. The interlinkage is retained, however, as it limits the weakening of the mixture, to the extent that it prevents the use of excessively weak mixtures under some circumstances. It cannot do so under all circumstances unless the carburettor is tuned excessively rich, and it often has the effect of preventing the attainment of economically weak mixtures when cruising, while allowing the mixture to be

weakened at full throttle, the opposite of what is really required. It must be admitted, however, that if positive limitation of the possible weakening of the mixture is necessary, it is very difficult to imagine any other simple way of doing it.

Whether limited in movement or not, the manually operated mixture control is at its best a clumsy device, and it will inevitably be replaced eventually by the automatically compensated carburettor. At the present time there is little inducement to the makers to produce carburettors with good characteristics, because the mixture supplied to the engine is always dependent ultimately on the position of the manually operated mixture control. The automatic carburettor would have a characteristic which gave the appropriate mixture strength at every throttle setting, with an automatic device to maintain these mixture strengths under changing external conditions such as occur with change of altitude. The development of such a device is being vigorously pursued and considerable progress has been made. The problem is one of extreme complexity, however, and it may be some time before a satisfactory solution is achieved. With multi-engined aircraft in particular the use of automatic mixture control would result in considerable and immediate reductions in fuel consumption, and in addition would lighten the task of the already overburdened pilot.

It is not generally known that the ignition advance may have quite an important effect on fuel consumption, especially when the engine is throttled. A few flight tests and a large number of bench tests have been made on a number of different types of engines, and they have shown that a distinct gain in economy is obtained by advancing the ignition as the engine is throttled. If variable ignition is introduced it will have to be automatic in action, as the addition of a further engine control is not to be contemplated, and the development of a device to give the correct ignition advance under all conditions is likely to present a difficult problem to the engine designer.

The subject of fuel economy has many ramifications, and it is impossible in an article of this nature to do more than discuss two or three aspects of it which, it is hoped, will be of special interest to the pilot. Improvements in engine design are constantly being made, and in some quarters many of the remarks above may seem to deal with a state of affairs which is already out of date. But to "the average pilot" this is not so, and it is for him primarily that this article is intended.

An aircraft is always subject to the over-riding considerations of wind and weather, which often determine the height and to some extent the speed of flight. Under any given conditions, however, with aircraft and engines as they are to-day, the ultimate factor which determines the range that can be attained is the skill and intelligence of the pilot.

"ALL WORK AND NO PLAY . . . "

BY "TOURIST."

WHEN I mentioned to a friend of mine that I was going to Russia for my summer holiday she looked at me in amazement and said "Whatever for? You will have an awful time there." The inevitable discussion followed and the gist of her remarks was as follows: "Do you realize that the slavery of the Russians does not even end with their working day, but their spare time is organized for them and their recreations forced upon them. They have no privacy at all, can never have private parties at home and even their children are taken away from them. Their life must be hell!" I did not, of course, believe all this, but I thought I might have a certain amount of difficulty in refuting it, for, at that time, I shared the opinion of most people that tourists in Russia are only allowed to see what a Bolshevik guide has been instructed to show, and I never dreamt that anything dealing with the lighter side of life would have any part in the programme.

However, I had not been in the country very long before I discovered that the guide's services were placed entirely at our disposal. She was there solely to take us where we wished to go, and to interpret for us. We could have dispensed with her guidance all day long had we wanted to, but we soon learnt that we could see many more things of interest and obtain much more information with her help. After all, what can a tourist find out by himself of the lives of the people of a country when he cannot speak a word of the language?

The Bolsheviks have now been in power for nearly fifteen years, and to the younger generation, men and women up to the age of about twenty-five, their régime is not regarded in the light of a tremendous political bouleversement, but as a normal and ordinary state of affairs, for they have never known anything different. They have certainly been roused by intensive propaganda to a feverish and almost fanatical desire to do their bit towards pushing on the Five-Year-Plan to a successful end by doing their work ungrudgingly and efficiently. But, having done their seven hours a day in factory or office they have the rest of the day to devote to recreation or education of some sort, and it is about this part of their lives that we hear so little and jump to the conclusion that in Soviet Russia it is all work and no play. In addition to these daily hours of leisure, every sixth day is a day of rest in most offices and factories where it can be managed without loss of output and efficiency; and the aim is, in the future, to lower still further the number of individual working hours. It would, therefore,

be a very foolish policy if the Soviet Government did not organize a great many recreational and cultural centres in the thickly-populated factory districts in addition to the numerous theatres, circuses and cinemas in the towns.

In modern Russia it is, of course, the factory worker who is most in evidence and, with the peasant, forms the backbone of the nation, and one of the most interesting innovations is the recreational centres connected with each of the numerous groups of factories which have sprung up all over the country during the period of the Five-Year-Plan. All these groups have their own Palace of Culture containing, as a rule, a good-sized theatre which is used not only for cinema, debates, music, amateur dramatics and so forth, but to which visits are paid periodically by first-class theatrical companies and concert-singers from Moscow or Leningrad. "The theatre brought to the worker" is a slogan in this land of the proletariat. Clubs, reading-rooms, restaurants, sports grounds, adult schools and every educational facility, children's crèches and nurseries are all provided in these centres.

Although all these things are at the disposal of the worker, it was made perfectly clear to us that attendance was absolutely voluntary. When they leave off work in the factory the women collect their children from the nurseries in which they have placed them during the day and take them home, or they can leave them there all night if they wish, for a small extra charge; they can have their meals very cheaply in the factory restaurant or they can go home and cook their own food; they can then go back to the factory, club or cinema, or to some outside place of amusement, or stay at home, according to how they feel. Even though the food-rationing system is in force it is quite a simple matter to entertain friends at home, for a worker gets good wages, in most cases his wife is earning too; their lodging and actual necessities cost very little, so any extra food and drink they need they are able to buy at a much higher rate at the open market or ordinary shops for which there are no queues as are sometimes seen outside the Co-operative Stores.

After I had visited a number of these Workers' Centres, all very similar, all reeking of the same disinfectant, all very clean and hygienic; and after I had seen innumerable dinners being served in hot and crowded restaurants decorated with artificial flowers and smelling of cabbage, I began to long for something a bit more colourful, less communal and not connected solely with the ubiquitous factory worker. But, of course, all these institutions are still quite new and form an integral part of modern Soviet Russia, and the guides are rather like children proudly showing their newest toy, confidently expecting unaffected admiration; and in their enthusiasm they are rather inclined to overdo it and create the impression that this is the best they have

to show, forgetful of the fact that the average tourist is still rather apt, unconsciously, to look upon these things from a bourgeois point of view. The correct perspective should be obtained from our own slum-dwellers and 3,000,000 unemployed who could compare these communal institutions with their present conditions at home.

We hear so much about the peasant and worker that it is very easy to forget that there must also be a vast number of professional men and women, office-workers, teachers, etc., all earning good money, and it is this class which one finds principally in the operas, theatres and cinemas in the cities. I went to several cinemas in Leningrad and Moscow, and in every case the programme consisted of one good Russian talkie only. Some of the films can now be seen in London so I will not describe them here, except to say that I saw very little of a political nature in any of them, and certainly none of the crude anti-religious propaganda which, I believe, is still being shown to the peasants.

One of the most inspiring scenes I saw in Russia was the interior of the famous Opera House in Leningrad. My first impression as I entered this lovely theatre, which contrasted strangely with the drab and dreary streets of the Leningrad of to-day, was that here at least was one untouched remnant of old St. Petersburg; but, when my eyes became accustomed to the scintillating beauty of the crystal chandeliers which illuminated the pale blue and gold decorations, I had time to look round and I found that I had made a mistake; this was not the old St. Petersburg of twenty years ago—it was the spirit of the new Leningrad of twenty years hence. What could be more symbolic than the Imperial Box surmounted by hammer and sickle, and packed with as many working men and women as it would hold. My seat was so arranged that I had an excellent view of the whole house but could see nothing at all of the stage without standing on tip-toe, so I had plenty of time to take in every detail of the audience. Most of the girls were wearing simple evening or afternoon frocks of artificial silk or voile; their heads were very neat and in many cases marcel-waved and make-up was as much in evidence as it is amongst an English audience. The men were mostly clad in ordinary lounge suits with collar and tie or in their customary linen over-shirts. They did not look at all like the crowds that thronged the streets and trams during the day, but had they not also done their day's work they would have been outcasts and starving at the street corner instead of sitting here amid luxurious surroundings listening to a perfect production of Tschaikowsky's "Eugen Onigen."

It would be altogether futile for me to quote the prices of entertainments, for the more I see of Russia the more I realize that their value of money is so different from ours that any attempt at comparison

would not only be very unfair but altogether misleading. As every place of amusement is always packed to its utmost capacity, and all seats have to be booked well in advance, it will be sufficient to say that, however high the prices may seem to us, they are evidently well within the means of the average Russian.

The climate of Leningrad is not very good and indoor amusements seem to be more numerous than outdoor ones, but in Moscow the reverse is the case, and during the summer months only a few theatres remain open. I did not visit any of these but I was rather surprised to see that one was giving "Hamlet" and another "Rose Marie." One of the chief summer attractions is the River Mockwa, which flows past the Kremlin through the centre of the town. It is crowded all day long and far into the night with pleasure steamers, rowing boats and swimmers. I will mention here that, contrary to what I had been led to believe, I did not see one girl who was not wearing a regulation bathing costume, although the men did not appear to be so particular in this respect. A little higher up the river there is a very large new bathing station with dressing-rooms, douches, grandstand, diving-boards and everything that could be wished for for aquatic sports.

Immediately opposite, on the other side of the river, is the Park of Culture and Leisure to which half the population of Moscow seem to find their way on a fine summer day. It was built in 1929 on the site of the city's old refuse dump. It measures two kilometres by one, and in spite of its rather high-brow name it is pre-eminently an amusement and sports park. The "cultural" side of it consists of museums, exhibitions, libraries, reading-rooms, classes for foreign languages and every facility for all who wish to improve their minds. But it is here that the Muscovite goes to enjoy himself, and sports are represented by open-air gymnasia, football practice grounds, volley-ball nets, tennis courts, shooting galleries and so forth, all under the supervision of a trained instructor or instructress. I also saw there a theatre, cinema, community singing, community dancing, a helter-skelter, miniature flip-flap, ice-cream and kwass kiosks, and many other side-shows. Although I spent about five hours there I did not see nearly all there was to see. One corner is given up to the children's playground and nurseries which seemed to be equipped with everything a child could possibly want, and it even included a small lake with miniature boats and a swimming pool. The park is crowded all day long and, on a fine evening, right up to the time it closes at midnight. The girls nearly all wore sleeveless summer frocks and were hatless and stockingless; the men were mostly wearing their embroidered white linen shirts or open-necked tennis shirts. Altogether they presented a picture of such perfect health and jollity that I found hard to reconcile with my preconceived ideas of life in the U.S.S.R.

Another evening I visited the Dynamo Stadium which is connected with a factory of that name and is used for all the chief sporting events in Moscow. That evening there was only practice going on and the view I got was like a composite picture of half a dozen sports all in progress at the same time. In the centre was a football field where a team was practising; immediately around the field was a grass track on which some men were sprinting while others were running round in gas-masks. Only some railings separated them from racing pedal-cyclists, and encircling the whole was a concrete track around which a motor-cyclist, complete with crash-helmet, was roaring at what seemed to me a tremendous speed. The stand would, we were told, seat 50,000 spectators, but the concrete track was shortly to be removed to another part of the grounds and the stand would then be enlarged to hold twice that number. The manager invited us to watch a football match which was taking place in a few days' time against a visiting British team. Very regretfully we had to refuse the invitation as we would already have left Moscow by then, but I saw later in a local paper that the home team had been the victors. In the park outside the stand were several hard tennis courts, and all were in use by players who appeared to be beginners taking lessons from an instructor, and much greater interest was being taken in the national game of volleyball on some adjoining courts. In winter time, of course, the only outdoor sports are ski-ing and skating, and in the club-house was a large well-equipped gymnasium, a full-sized aeroplane for instructional purposes, bath and massage rooms, douches, restaurant and rest rooms. This visit to the Stadium was an altogether unexpected surprise to me as it had never even occurred to me to inquire whether sports had been given any place in the Five-Year-Plan, but evidently they have, or so much money and labour would never have been devoted to that purpose.

I have not mentioned anything about ball-room dancing because, although it is indulged in in the more expensive hotels and privately, it is not officially encouraged and the people themselves seem to prefer community and national dances. Horse-racing and trotting races are held every afternoon and evening in Moscow during the summer. Rest houses are available to every worker for their annual month's holiday.

I do not think that the Russians can complain of having nothing to do in their spare time, and most of them are looking forward to the day when their working hours will be reduced to five, four, or even, some say, to three a day. Every taste seems to have been catered for and if some of the older ones still prefer their vodka to more healthy and strenuous pastimes, it does not matter very much, they scarcely count at all, for modern Russia is essentially a land of healthy, exuberant Youth.

THE R.A.F. IS NOT ALL WORK

BY FLIGHT-LIEUTENANT A. L. A. PERRY-KEENE.

A CHRISTMAS Eve in Iraq found a party consisting of members of the R.A.F. some thirty miles from Mosul on a shooting expedition. They had arrived in their own cars, a feat of which they were all somewhat proud—as an examination of the vehicles would warrant. Four very ancient Fords of unknown pedigree, not too sound mechanically and certainly lacking in showroom finish, had actually stayed the course, which was a thing hitherto unknown to their owners.

Round the camp fire in the evening, when everyone had explained away his bad shooting to his own satisfaction, someone suggested that this motoring business might be taken more seriously, for motoring in the LAND WHICH WAS IN THE BEGINNING certainly has to be considered a little more carefully than at home, particularly when—on account of limited incomes—the cars are not such as would be found in the vicinity of Great Portland Street. Roads are few and far between, water away from the rivers is scarce except in winter, and cars must be self-contained for spares, as garages exist only in the few large towns. In addition, it is not really advisable to motor without a second car in convoy, as a breakdown may be of serious consequences, particularly during the hot weather.

A concrete proposal was put forward to found the Mosul Motor Club and tour the country in company, which would be reasonably possible with the mutual support a club could give. The motion was carried unanimously, and thus came into existence the merry band whose odyssey will now be described.

The Club, as originally conceived, had a membership of four model T Fords, as thus the number of spares to be carried could be reduced, as besides personal needs, such as food and bedding, the majority of cars travelling in Iraq carry main spare road springs, the greater parts of an extra back axle, a spare piston and connecting rod, and such other parts as the driver fancies, according to his experiences of the particular weaknesses of his car.

One of the first runs undertaken by the newly-formed Club was from Mosul to Baghdad to see the final of the Novices' Boxing Competition, in which the Club's station fancied its chances. Each car had been overhauled, and regular operation orders designed to contend with any contingency had been issued to all crews.

The return distance is some 520 miles—not a great journey in England, but, to the Club, an undertaking comparable almost with an

air crossing of the Atlantic. Starting away at dawn the four Fords, "Henry," "Bluebird II," "Rumbler" and "World's Worst," drove along the track on the right bank of the Tigris on a southerly course, everyone full of excitement at the thought of probable adventure ahead. The oil wells at Quiyrah were reached by breakfast time, the next stop being Shergat. The modern Shergat is the site of Asshur, the one time great Assyrian city, of which there is little to be seen now except mounds of earth, yet at one time the very track on which the Club was travelling had probably been used by chariots of the Kings of Nineveh, which vehicles, as a member of the Club who was changing a tyre remarked, did not have to contend with punctures. The pneumatic tyre is not seen at its best in Iraq, a burst or puncture every 100 miles not being considered excessive. It is a common sight to see half-a-dozen inner tubes slung round the steering column ready for use, and even aircraft carry spare wheels.

The latter end of the day saw the Club over the hills which line the banks of the river at the Fatah Gorge and on to the Baiji Plain, an open stretch of level, hard-surfaced country which would be a speedman's paradise or the forced landing king's dream. Rather surprised with itself, the Club spent the night at Baiji in the Government Rest House, the hours before sleep being spent in a discussion on the chances of making Baghdad the next day, supping off a comprehensive selection of the fifty-seven varieties of a well-known canned food provider, and listening to the gramophone, which instrument, by the way, soothes many a savage breast during the hot weather.

The forenoon of the next day found the Club approaching Samarra, one of the holy places of Iraq. The mosque, which is roofed in gold, looked very expensive in the sunlight, although it appears more impressive when seen from the air. On rattled the gallant Fords, and by late afternoon four very happy, though somewhat dirty and tired, car crews crossed the Tigris at the Maude Bridge and triumphantly entered the City of the Caliphs, through which they drove with all the pomp and circumstance of conquerors entering a fallen city. The Iraq Aircraft Depot provided the Club with all the comforts of home life, and with as fine an exhibition of novices' boxing as could be wished for. They also provided facilities for the much-needed overhaul that each car required.

The return journey started with the stars set in their courses against the Club, as the first ten miles were to show. "Rumbler" signalled distress, which investigation showed was a badly-seized engine. As leave expired at the following midnight it was decided that "World's Worst" and "Bluebird II" should carry on towards Mosul in company, whilst "Henry" towed "Rumbler" back to Baghdad to a garage for inspection.

Feverishly "Rumbler's" crew tore off the sump, to find therein a large and vital part of the centre bearing housing, which meant at least the fitting of a new top half of crankcase. The position was bad; "Henry" could not carry the double load; there were no trains—in any case, the railway only gets to within eighty miles of Mosul—money was very, very scarce, and, even if a new crankcase were obtained, leave would have expired by the time the old shaft, pistons, etc., were fitted.

Fortune came to the Club's aid. The proprietor of the car garage said he would be very pleased to sell an Overland, which he was certain would do the journey. Rather doubtfully it was inspected; all four cylinders appeared to fire; a short trial run showed that it was in fair condition, so after a hasty committee meeting "Rumbler" and eighty rupees stayed in Baghdad, whilst the Overland and "Henry" headed for the north.

After an unpleasant journey through a sandstorm, the two cars found themselves at Samarra for the night, with the satisfactory thought that the others were ahead, and that the Overland looked like staying the course.

The next day "Henry," whose behaviour had so far been exemplary, developed ignition trouble, and had to be coaxed along, so that by the time night fell the two cars were still some thirty miles from home. It was found that "Henry's" ignition trouble extended to the lamps, and the Overland, having lent its battery to "Henry," was also without lights.

Progress was somewhat slow and hazardous, and with four hours to go to midnight (when leave expired), "Henry's" ignition ceased entirely six miles from home. The Overland carried on to Mosul, where it informed the other two cars of the situation. Out came "Bluebird II" and "World's Worst" with a tow rope, and, with time to spare, the Club completed its first big run poorer in pocket, but a great deal richer in experience.

* * *

In England, His Satanic Majesty seems to have left many souvenirs of his visits, as such places as the Devil's Punch Bowl, the Devil's Dyke, and so forth prove. In Iraq he has gone one better, for not fifty miles from Mosul he has a temple where thousands of natives worship at his shrine. These followers of the Evil One are called Yezidis, and are known locally as the devil worshippers. The origin of their beliefs is shrouded in mystery, but it seems fairly certain that their temple was at one time a Christian monastery, and that a certain discontented Christian Kurd, by name Shaik Adi, played a prominent part in the foundation.

The worship of Satan is more in the nature of propitiation than love, the Yezidi preferring to keep in his good books rather than fight against him. Among their prophets are Christ, Moses and Mahomet, so it will be seen that the religion should appeal to many tastes.

The Club decided on a grand circular week-end tour, which should include a visit to the Yezidi shrine, the first objective being the Christian monastery at Al Kosh. "Henry," "Bluebird II" and the Overland started off, leaving "World's Worst" to have the complete overhaul which the Baghdad trip had necessitated.

The start of the Club was always worth seeing. A zero hour and a rallying point were fixed beforehand, and the various crews would get busy loading up. The loading formula was simple, consisting, as it did, of piling things on to the cars until the clearances between mudguards and tyres were reduced to the minimum, and then re-arranging things so that the crews could find accommodation in the vehicles. Next came the starting up. This ceremony usually consisted of three stages: first, the engine would be cranked round hopefully whilst one of the crew juggled with throttle and choke levers; next, one of the back wheels would be jacked up to allow for a heartier turn of the starting handle. Success would sometimes come with the second operation, but more usually the cry of "Jib push" would echo around the camp, whereupon crowds of natives would push the car until such time as it decided to start.

On this occasion a perfect start was made, and the Club, after threading its way through the Mosul streets, headed for Al Kosh across the Tigris bridge, and the Christian village of Tel Kaif was soon reached. Here it is reputed the inhabitants get drunk every Saturday evening on the local wine, a statement which the Overland's crew wished to put to the test. Wiser counsels prevailing, however, the three cars moved onward until Al Kosh was reached. The monastery at Al Kosh belongs to the Chaldeans, who are native Christians owing allegiance to Rome. Here the Club were the guests of the monks, and spent a most comfortable night, after an evening's discussion on the affairs of Church and State with the Prior.

Early in the morning a visit was made to the older monastery of Rabban Homidz, which was perched on the face of a cliff quite close to Al Kosh. As the climb was up a gradient of the one in four variety in places, the Club had no option but to walk, a means of locomotion which apparently annoyed one of the Assyrian conquerors, as he has left his record on stone not very far from Al Kosh that: "Here I, even I, Tiglath Pileser, was obliged to walk."

Some of the Club found it hard going, but the climb was certainly worth it. Here was a fifteenth century monastery which, since that time, had held up its head against the Mahommedans on one side and

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the Yezidis on the other; a place where men, strong both in body and mind, must have lived, so Spartan were its appointments.

The Prior welcomed the Club most heartily, and proceeded to explain the exhibits. Some rings which supported Rabban, the founder, in prayer, and prevented him from going to sleep during his lengthy spells of supplication, were shown, as was also a chain used to fasten lunatics to the altar. Those mentally afflicted were chained to the altar overnight, and if alive in the morning were pronounced cured. An idea was mooted to try this out on one of the Club members, who, however, put up a counter-proposal that the original project to visit the opposition department of devil worshippers should be carried out.

The Club said good-bye to its hosts at Al Kosh, and headed for Ain Sifni, which was the next objective, where a police escort had to be picked up. This was reached by a track along which very few cars could have travelled. The route went through quite another type of country from that usually traversed by the Club, and some specimens of the Yezidi were soon encountered. The men, with their hair in long curls, and the unveiled women were different from the Arab or Kurd, but the Club found them to be quite friendly when the way was inquired at one of the villages.

Ba'Idra was soon reached, and the house of the Mir (or Chieftain) of the Yezidis came into view. This place looked not unlike a castle of a bold, bad baron of medieval times, and, indeed, the Mir exercises his overlordship on feudal lines. For generations succeeding Mirs have arrived at their position by murdering their predecessor, and it seems likely that the present one may relinquish his command through the agency of a bullet or one of those most unpleasant-looking native knives.

The Club slid down the side of a hill which would have brought joy into the hearts of the promoters of a motor-cycle reliability trial, and after negotiating a ford of the type the War Office use for testing tanks, found themselves at Ain Sifni, where a police escort was collected. From there it was possible—but only just—to motor for some four miles before walking the remaining distance to Shaik Adi. The walk was truly delightful, following, as it did, a stream, the banks of which were lined with shrubs and trees in the glory of their spring coats. The temple came into view quite suddenly, and the Club found itself in the courtyard of a building which seemed to be part fort, part church, and having the typical fluted Yezidi cones towering above it. The whole effect was spoilt, however, by a foreground, consisting of a guest-room made of wood and tin, and painted pink, of which the priest who received us was intensely proud.

After the ceremonial drinking of tea and after small talk—which was, indeed, small, as no member of the Club spoke Kurdish, and the escort

did not appear to speak it, or Club Arabic either—a visit to the interior of the temple was made. A large black serpent carved on the wall beside the door was proudly pointed out by the priests, and in the stockinged feet which convention required the Club stepped over the entrance and found itself in an unlit building not unlike an average English parish church, but without windows.

The fact that the only light was a dim taper, and that the building was dedicated to the Prince of Darkness, quieted down even the most loquacious member, and by the time the Holy of Holies was reached it was felt that it was time to start moving home. The Holy of Holies is a building adjoining the one seen on entering the temple, and contains a box covered in cloth, said to contain the bronze image of a peacock known as Melek Taus, the Yezidis' most cherished possession.

On the way back to the cars the scenery seemed to be more beautiful than ever, and it was impossible not to reflect on the extraordinary religion that combined the spirits of Beauty and Evil in its creed.

Not long after leaving Ain Sifni it grew dark, this usually having a bad effect on the Club, as the lighting systems of the various cars were always liable to strike when wanted. Soon the line of cars halted on account of a ditch across the track, which, in the dim headlamps, looked almost impassable. By dint of much pushing, however, all the cars got through, and, apart from "Bluebird II's" lights fusing entirely near Khorsabad, the ruins of Sargon's city, the run home was made without further incident.

Z050.

BY SERGEANT A. W. H. MACDONALD, R.A.F.

WITHIN the hangars of the Royal Air Force Station, Zaddi Bek, it was slightly less infernally hot than outside. The heat had a different quality. It was more sticky and oppressive, but it lacked the white-hot, sledge-hammer glare of a grim and torturing sun.

Towards evening the sun's grip would doubtless slacken a little. Then there would be movement in the camp, a going to and fro, the sw—i—i—sh of shower baths.

As yet nothing moved, for it was early afternoon, and all life waited on the sun's majesty. Only, far away, a mirage danced alluringly. Behind the hangars, in a mud-box with walls two feet thick, a native sentry dozed over a bayonet that was uncomfortably hot to the touch.

Zo50 stood in the darkest corner of the hangar. She had been pushed there to make room for her newer sisters. For Zo50 was old, very old. And worse, she was obsolete. The machines that had lately arrived and replaced her fellows were of a new and splendid type.

They were constructed of metal, while her skeleton was merely wood. It had given her a certain amount of trouble in that trying climate. And—they drank no water. Their engines were air-cooled. Zo50 chuckled softly to herself at that. Air-cooled, indeed! She was the last of her type in the Squadron. One by one her fellows had departed, flying their last journey to the distant Depot and the inevitable fate of all machines—good and bad. Soon she would follow.

The metal hangar creaked and groaned as it expanded. The new machines creaked a little too. They were not used to the heat; they seemed too overcome to talk. Zo50 was not sorry, for, on the whole, their talk annoyed her. They were so youthful and presumptuous. Zo50 dozed and awaited the coming of the evening.

"Ph—e—e—w!" exhaled one of the new machines. "Is it always like this? I'm hot inside and out, day and night, and you know"—she dropped her voice confidentially—"I'm rather afraid of my petrol. It might explode or something."

Zo50 roused herself a little.

"No," she replied. "It's not always like this. The summer's nearly over now. In a few days, very soon at any rate, it will rain. Then it will get cooler and cooler until you'll stand here and shiver as the wind whistles across the 'drome."

"Rain?" queried the other. "What's that?"

'50 hesitated a moment before replying.

"Water—like an awfully big radiator leaking all over everything. Not that you'd understand that, you having no radiator. It's cold and wet and gets in everywhere. Very bad for you if it gets under your cowling. You'll see."

"It can't be very bad if it's cool. I'd love to be cool."

"Umph!" grunted '50. "You'll be cool all right when you're pegged down somewhere out in the blue on Operations."

"Tell me," begged the youngster, "what are these Operations? I heard my Fitter and Rigger talking about it the other day. They didn't seem to like it. Is it something unpleasant, like a forced landing?"

"There are always forced landings in Operations," said '50. "And worse very often."

"Crashes?" whispered the youngster.

'50 assented.

There was a short silence.

"But tell me," began the youngster again, "what are Operations?"

'50 roused herself to reply shortly.

"War!"

The youngster bit on the new word a little thoughtfully.

"But what," she asked again, puzzled, "does one do?"

"Fly," answered '50.

"You see," she went on, "when the rain that I was talking of has filled the waterholes and opened the desert the tribes begin raiding. Then we go out day after day after them, bombing when we catch them."

"Ah! Slaughtering the poor devils, I suppose?" said the youngster.

'50 laughed sardonically.

"Slaughter! Ha! Ha! That's a good one. Wherever did you get that idea?"

"Why, my Fitter——."

"Pooh! They've only been here a few days themselves. They know nothing about it. Couldn't you tell that? M'm, well I suppose you weren't to know. But didn't you notice their skins? Palefaces we call them."

"Yes," agreed the other, crestfallen. "They *are* lighter than the other men. Yours for instance."

"Mine? Yes, that's Bo Menton," said '50, respectfully. He's been here longer than *I* have—and that's saying something. He's 'on the inventory,' as we say. And a finer fitter I never had. I will say that—and tough."

"Yes" went on '50, in a sort of grumbling monologue. "We go

out day after day at the crack of dawn, a 'three' formation, and we fly and fly, and we land here and land there, and come home tired out, tanks nearly empty, and see nothing. And sometimes that nothing throws bullets up at us. Thump! they go, just like that, and you've got it. Maybe in a tank or your engine. Then it's serious. Maybe just a hole through your fabric. I've had one in my rudder bar!"

The youngster shuddered. "I shouldn't like that," she exclaimed.

"Sometimes," went on '50, "your crew gets shot. That's awful. There was '59. I was in the formation and saw her go down. We were at six thousand, and when we got down there were your poor slaughtered devils all over her. They tore her to pieces, and her pilot lay very still beside her. Slaughter, indeed! We brought the pilot back—wrapped in my engine cover and lashed to my luggage carrier—dead."

"Pilot—dead?" echoed the youngster, wonderingly. "Like the gazelle I brought back the other day? Limp and—dead?"

"Yes," said '50. "Just like that."

"Well," said '50 abruptly, "I'm going to sleep. There'll be no peace half the night, I suppose, with so many of you youngsters unserviceable. You make a terrible lot of work for your fitters and riggers."

The youngster sighed. It was true that she and her sisters had been smitten with a number of defects that the clever designer at home had never anticipated. Life in this country seemed very difficult.

"Air-cooled!" growled '50 to herself.

The conversation languished.

When time hung for a space before daylight, and the morning star glowed against a faint lightening of the eastern sky, '50 sniffed the breeze. At that hour a little warm breeze slips like a sigh across the wakening desert.

'50 sniffed again deeply. Instead of blowing across the mouth of the hangar to-day it blew straight in and eddied round '50's gaunt figure. The breeze carried a smell, a heavy smell of river mud and dank vegetation, with the sharp, sickly odour of date palms in mass. The breeze passed on and died as the long notes of the "Réveillé" wailed over the camp.

"Rain!" said '50. "Now you'll see."

For hours it seemed that '50 had spoken too soon. In a few moments the sun climbed into the heavens. The sky was as blue, the sun as hot, the glare as bright as it had been each day for months—or so it seemed.

But towards afternoon a tiny dark speck appeared on the horizon where the mirage had died. It grew, and spread like an unfolding fan,

of even, greyish texture. It reached up and blotted out the sun. The glare gave place to a sullen greyness. Then came a little wind, and behind it the rain. Solidly it hurled itself at the parched ground with a hiss like quenched steel. And the ground received it gladly, its cracked surface leaping and capering. Or so it seemed. The noise of the rain on the hangar roofs set up a steady deep roar. The temperature fell rapidly. Although the 'drome was on high ground, the earth could neither absorb nor conduct the rain away. Everywhere was flooded a little. The troops, always eager for novelty, rushed out and stood laughing and shouting wet to the skin with this warmish, sticky, glorious rain.

It did not last long. In a few moments the downpour tailed off and ended miserably with a few belated spots. But the grey sky remained, banked, silent, impassive. Summer was over. Even now the greedy earth sucked in moisture almost audibly. The air was full of the sound of drops falling from eaves and splashing in the pools. The air was fresh again; everyone laughed foolishly, drinking in great gulps of it. The first rain had come.

For a matter of days rain alternated with sunshine. It grew cooler day by day. The troops assumed their winter clothing. Then came a fine spell. The clouds were gone. The sun shone beneficently from a radiant sky. Throughout the camp there was an air of alertness. It might have been merely the reaction after the long, enervating summer. But mingled with it was an air of expectancy. '50, with the keener perception of age, noted it grimly; the youngsters took it as a matter of course. In the hangars there were inspections of tool kits, of desert rations, of the thousand-and-one details that keep a Squadron efficient in the air. There was no cessation of flying, of course. The youngsters were nursed, tested and overhauled, and screwed and inspected into serviceability. The troops cursed them and gave them an extra polish.

"'50," said the C.O., standing in the hangar. "When is she due away?"

"Depot said they'd let us know, sir," answered the Adjutant. "Not ready for her, I think."

"Um. Better put up a letter," said the C.O., gazing at the old craft. "Fine old bus. I brought poor Palswick back in her. Before your time, of course."

"Yes, sir," answered the Adjutant, obediently.

"Um. Never mind that letter. Let it go. She might be useful again yet."

"In view of those instructions——."

"Exactly!" said the C.O. "By the way, while we're on the subject of those—er—orders, how is the Ration Store?"

" Well, sir, I—er——." The Adjutant was rather new.

" I'll see it myself ! " said the C.O., and led his subordinate away.

That was Saturday morning. When at midday work ceased, and the hangar was left to its week-end stillness, '50 found the youngsters had acquired a new respect for her. She enjoyed being treated with respect and thawed considerably. They were all in the midst of a long, friendly chat—at least, '50 was talking and the others listening—when two airmen appeared. In a few moments the whole flight was there stripping off engine and cockpit covers, and preparing the machines for flight.

" Hullo ! " said '50. " This is *it*. Off we go. Or at least off *you* go, for I don't suppose I shall ever go out on a raid again, despite the C.O.'s nice words."

Sure enough the machines were wheeled out. The armourers appeared carrying twenty-pound bombs and long swaying belts of ammunition. The camp had wakened from its afternoon peace to unexpected bustle. The pilots came equipped with maps and parachutes, and talked eagerly in a bunch in the hangar. Sitting back on her undercarriage and gazing gloomily out on the busy scene, '50 caught scraps of the conversation.

" — down by the diamond."

" — four or five hundred."

" Rubbish ! Half-a-dozen mangy camels."

" One ninety—no, better say two hundred for two hours; that'll bring us to——."

" Hell ! It isn't marked on my map ! "

" Hello, Smith "—this the wag of the Mess to his gunner. " Desert rations aboard ? "

" Yes, sir."

" Chocolate ? "

" Yes, sir, *and* the chewing gum."

Smith, the gunner, was in a hurry.

" Chew that ! " remarked someone, and the laugh was against the wag.

In a very short time the three machines taxied out, and after a little pause roared away together and were lost over the south-west horizon. Those of the men who were not " crew " lounged about the hangars and speculated much. Little was known beyond the fact that Ishmael, the perennial nuisance of the border, was " out " again ; was reported to be moving towards " our " territory with a force of camel men that shrunk or enlarged, according to the taste and temperament of the teller.

Towards dark the formation returned. From time to time the leader had reported his position by wireless. He had reconnoitred the area

given him, and had seen nothing. Ishmael, that phantom leader of a phantom band, had vanished from the position given by the S.S.O.

The formation broke soberly. No stunts with bombs aboard. Then the starboard 'plane landed quickly with a still engine, not waiting to follow the leader. The last few drops of her engine oil splashed languidly to earth, her undercarriage was sticky and black with it.

"Engine petered out on me," explained the pilot.

"Sure you didn't switch off, sir?" asked the Flight-Sergeant, who had gone out on the Hucks Starter.

"Positive," the officer replied. "Look for yourself."

"Give her a swing!" ordered the Flight.

"Half-a-minute, Flight," called the Fitter, who was examining the engine. "Look at this!"

There was a piece taken neatly out of the crankcase. The oil had been forced through the hole, and the engine had seized up solid. But the machine was home. Later they found the bullet inside the crankcase.

"But dammit," expostulated the pilot, a little shakily, "it might have been me!"

The machines were wheeled in. Orders had been received to keep them "bombed up" in the hangars, ready at a moment's notice to set out after Ishmael. The palefaces were surprised. The old hands shrugged their shoulders and went over the details of engine and air-frame twice to make sure. The hangar guard was doubled.

The injured craft was wheeled in alongside '50. She ceased not to bemoan her fate. '50 forbore to say, "What did I tell you?" In answer to the other's moans she only said, "Well! Well! It might have been worse! Might have been your pilot, you know. As it is you'll have a thorough examination, a new engine, and in a few days you'll be as right as—as I am," she ended, defiantly.

In the hangar there was a new atmosphere. The machines were acutely conscious of their loads of bombs and of their injured sister. Truly this was war! Very unnerving and uncanny. They all swore they had seen nothing, and yet here was one of them seriously injured. She might easily have been a nasty tangled mass now. Still the luck had held. '50 pointed that out. Soon she would be well again. But the bombs worried them. It was not their weight so much as the knowledge of their deadly nature. They could blast and smash and destroy. This they had seen during practice.

"Steady everywhere," called '50. "These things won't hurt you. Can't!"

"But," complained one, "my racks don't feel very secure. I'm sure I shall drop one, or perhaps four."

"M'm," said '50. "These new type releases aren't all they might

be, but even if you drop the lot they can't explode. They've got to fall quite a distance, you know, and, anyway, the safety pins are in, aren't they? "

" But I don't feel safe," moaned the other.

" That's just it," they all exclaimed. " Not safe, not safe! "

" Well," said '50, " that's how you ought to feel. You're not intended to feel safe. You're built for war, and war is very unsafe."

The men were at work late in the hangars that night. There seemed something to be done on every craft. And the men were like the machines, keyed up. The word passed round that the whole Squadron would be out on the morrow.

Sure enough, dawn saw three flights of three on the 'drome with engines running. All through the night the ether had thrilled as wireless messages sped in all directions. At midnight a section of armoured cars had arrived, cursing tribesmen and tracks turned into bogs by the rain. Then they had vanished into the south-western darkness. The troops had come straight from patrolling the camp to wheel out the machines. Through the long night every jackal's howl had sounded ominous.

The formations roared away towards the faint light over the rifle butts and immediately vanished. A chastened and beneficent sun drove upwards in a sky of incredible blueness. Outwardly the camp was still. Really a great deal of work was going on.

In the wireless cabin the message forms piled up, and were periodically collected by a motor-cyclist, who dumped down another pile of " out " in their place. Workshops laboured to put another engine on the test bench. Another section of cars arrived, and later a detached flight from another squadron, followed by a great troop carrier. A string of closed steel trucks, drawn by a cranky, screaming, petrol locomotive, groaned wearily along the branch line from the junction.

Orderly-room clerks sweated to keep abreast of the rising tide of forms, returns and orders, the Corporal scowling at a ration strength that seemed to grow as he watched it. Storekeepers made out " demands " and more " demands," cleared more space in the petrol dump, and arranged to send a portable lighting plant to the S.S.O. Armourers checked ammunition, cleaned and examined rifles, tested machine guns and toyed dangerously with detonators.

A message was received in the little wireless station near the hangars that worked with the machines, and a runner set off for the Orderly Room. Keen eyes searched the sky near the horizon, where presently hung a speck that grew into a machine and landed abruptly. The C.O. climbed out. He was annoyed. Exceedingly annoyed and scandalized. He had been " shot up " and forced to land a few miles out. The other machine of his flight was with the damaged craft. He

demanded another craft immediately. He was terse, but inwardly, no doubt, extremely voluble.

"All the new ones are unserviceable, sir," said the Flight-Sergeant. "Waiting for spares."

"Grumph!" said the C.O., clearing his throat menacingly, as was his custom when annoyed. "Good God!" he snapped. "Unheard of! Not your fault! Got nothing at all?"

"There's only '50, sir."

"M'm. '50. All right, she'll do. Wheel her out and start up. I shall take off in ten minutes."

He stamped off to his office, swinging his gloves.

'50 could hardly realize her good fortune. At first she thought it was to be her last journey to the Depot. Instead, armourers hurriedly clamped bombs into her racks. Then she knew that by some trick of fate she was to go out again south and west on duty. She trembled. Her engine sprang to instant life. She would show them. Obsolete, eh? One last glorious burst anyway. And the C.O. was to take her!

The C.O., on being "shot up," had been forced to land. Fortunately, the desert over which the formation was flying being just desert it was fairly safe to land anywhere. One flight of the formation had landed with him. Ascertaining that his machine was seriously damaged, he had promptly taken young Mr. Flattery's machine, which was in ballast, Mr. Flattery, a pilot officer, being still under training—and brought young Mr. Flattery back to get another machine.

In a few moments he reappeared, conspicuous in his old blue boiler suit, fastened at the ankles with cycle clips. He was a big man—in every sense of the word. He climbed up and glanced in '50's rear cockpit, where a couple of sandbags had been hastily secured. The machine in which he had returned had been likewise ballasted for Mr. Flattery.

Without a word he ran up '50's engine, then waved away the chocks. The two machines taxied out together. '50's eager engine roared triumphantly. Her tail rose. Faster and faster the tawny earth slipped past. She was off!

Once more she was in her element. Too long she had been chained down there. How glorious it was to be up once more, away, free, and in the capable hands of the C.O., for '50 trusted him implicitly. Some men have that faculty of exacting complete trust from the machine they direct. Then man and machine are one: he is her brain, she an infinite extension of his limbs and nerves. The newer craft behind was palpably nervous in the youthful hands of Mr. Flattery. '50 observed it and chuckled. The C.O. turned abruptly, and regarded Mr. Flattery's machine.

They drove on fiercely south and west. The bare dead land now brown, now streaked with black, now overlain with a faint light thread that was a broad camel track, rolled uneasily away from them. '50 was "full out," and she liked it. Every ounce of power and speed that was in her she would give to this heavy, square-jawed, silent man who held her in his hands.

"Hi!" called the other machine. "You're going some, aren't you? I'm faster than you, and it's as much as I can do to keep up."

For answer '50 urged up another couple of "revs." and laughed.

"Get a pilot," she mocked.

"Oh, dear!" screamed the other. "It's not my fault," and drove forward a little nearer. "There—my throttle lever isn't supposed to go through the 'gate' below 6,000."

But again '50 only laughed, mocking, exultant—a little drunk perhaps with her own speed.

In a few moments they located the disabled craft and her sister, surrounded by the friendly tribe that inevitably appears over the horizon when a machine lands. '50 and her companion landed. Quickly the ballast was removed from '50, and the C.O.'s gunner mounted his gun on her gun-ring. Leaving the damaged craft in the care of the friendly tribe the C.O. led off again on his interrupted raid.

He flew rather low, seeking the retreating tribesmen. Presently, in such a few moments, '50, looking ahead, saw a tiny part of the desert that appeared to be in motion, then suddenly stilled. Her pilot had seen it too. So had the gunner. It was the tribe they sought, now halted and scattered, each camel kneeling, each rider squatting beside, his astonishingly modern rifle aimed at the formation.

The machines roared together over the target. It was no time for niceties of aim. The C.O. gave the signal to release. Each machine heaved ever so slightly as all her bombs left together. The machines raced on. Now they were over their target. Below, on the tawny surface of the desert, appeared tiny, light blobs, growing with incredible rapidity into great round blossoms of smoke and dust. There came a confused sound, felt rather than heard, above the engine's roar. At that instant Mr. Flattery's machine fell away from the formation. Hit, maimed, awkward, the craft struggled to earth. The C.O. had seen. Without a moment's hesitation he banked '50 round sharply and put her nose down. '50 saw the other sprawled out, her undercarriage gone. Mr. Flattery was out of her though, and watching them. Skilfully, coolly the C.O. put '50 down. Mr. Flattery ran towards them as they taxied.

"On the wing!" yelled the C.O., waving. Mr. Flattery understood. Almost before '50 had come to rest he had run alongside and scrambled on to her starboard lower plane, lying flat against her

fuselage. From above the other machine, watching, dived suddenly away from them over the little rise that was now their horizon. They heard her front gun snapping fiercely. Then over the crest came the forefront of the wave of infuriated tribesmen.

But too late. Already '50 was moving faster and faster. She was off and rose proudly. Rifle fire followed her. She felt one or two dull thuds. They headed for home. '50 was sobered now. She flew her best. Steadily, evenly. The other craft formatted to starboard.

As they arrived over the 'drome, the C.O. waved away the other machine and took '50 down to land first. Slipping easily down with engine almost silent her wires hummed the landing song. She felt proud of her work that day. Down, down, steadily, over the barbed wire fence to the ticklish last few yards.

From above, as she circled the 'drome, the youngster watched. She had been that day in the presence of great deeds. She was still wondering. She watched the brave old craft nearing the racing earth.

Then, without warning, '50 was a dead and mangled mass. What happened was never established. Only she struck and crumpled. Her tail rose and rose, then slowly fell back, as though a death agony was finished. The youngster saw Mr. Flattery and the gunner flung clear; she saw Mr. Flattery jump up and run forward to the wreck; saw him hurl himself bare-fisted at the devil's maze of wood, fabric and wire, tangled horribly, that had been '50. Already a tall, thin finger of oily black smoke reached up and marred the blue sky. In a few moments '50 would be a destroying furnace. And within that jumble was a *man*.

The youngster could not see Mr. Flattery tugging, wrenching, heaving, for the smoke had become too dense, and she was concerned with her own landing. Her pilot put her down as near as he dared. Once down, she saw Mr. Flattery emerge from the cloud as a drunken man bearing a living burden. Then came a dull, booming roar that for a second filled the sky. '50's tank had exploded. There was a great wailing note from the crash alarm, and bells sounded.

Within the hangar that night there was a silence. The youngsters had nothing to say. Only the night breeze running lightly across a heap of hot ashes and entering the hangar murmured "'50! '50! "

AH LUM'S DEUS EX MACHINA.

BY PETER FERRERS.

I.

AH LUM sat beneath the shade of the Dragon Rock and looked down upon the winding multitudinous streets of the town beneath him. Their tortuous ways were filled with scurrying, chattering Chinese as the runs of an ant's nest are congested with the insect traffic, but these were for the most part hidden from Ah Lum's view by the overhanging roofs, with their devil charms, twisting hideous and grimacing about the roof trees. Here and there a bend in a street on the lower roof of a temple showed him the thousands of blue-clad coolies, the beggars in their filthy rags with an occasional long-gowned merchant, suave and inscrutable, above his greased black attenuated moustaches. Even had he not been able to see the inhabitants he could not have missed the noises of life, for the clamour was unceasing, nor yet could he have overlooked the smells which arose from so unsavoury a city.

The Dragon Rock was situated upon a hill in the very centre of the town, and the path to it was worn daily by the feet of countless pilgrims who came to see the place where Confucius had laid the mark of his palm far back in the gloom of the ages. Quite apart from the sacredness of the spot, it was a place whence one could observe the whole of the walled city, the stretches of paddy beyond in all directions, reaching on the one hand to where the deep green of the sea was fouled by the brown waters of the River of Fragrant Streams, and on the other to the great ranges of mountains rising in the blue-grey infinitude of distance. It was a pleasant enough spot in the cool of the evening when the sun had fallen low and the cicadas and bullfrogs were commencing their interminable concert. A place for meditation—a place for soliloquy.

Ah Lum had need of both, for Ah Lum was in love. He was not an outstanding young man from the point of view of general appearance and, in a country where, to the foreigner's eye, all the inhabitants resemble each other like so many sheep, Ah Lum was just a Chink like all the rest. But the discerning observer might catch a glimpse of beauty in those long dark eyes and a slight difference of expression, more human, more emotional, in the smooth impassive face with its high cheek bones and olive parchment complexion.

Ah Lum was thinking—philosophizing with himself. He loved Mee Lang Fu very deeply for she was as sweet as a cherry flower

in spring, as lovely as the jasmine buds she wore in her hair beneath the moonlight. Her hands were almond blossoms, tiny, soft and white, and her narrow heavy-lidded eyes were like dark brown wells in the shade of the willow. To Ah Lum she seemed a soft veiled glimpse of Paradise, and he wanted to marry her. Thinking of her, the creases in his yellow forehead smoothed and a tender smile curved the corners of his lips. But, presently he frowned again and once more his mouth assumed its set line for—as it is true among the Western nations, so is the saying also true in the Orient—the course of true love is not a smooth and easy path, and the fly in the ointment of this particular love affair was that Ah Lum was a gambler. Also, he was a gambler who had amazingly bad luck. Nevertheless, in common with all his countrymen in Fukien, if Ah Lum had money he could not keep away from the gambling tables, his fingers itched at the sound of the Mah Chuk counters and when he had drawn his pay he would go each week to the Sha-Tin Tea House where he would play puck-a-poo or fantan until all his money was gone. Then he would curse his luck and wander listlessly with the scurrying tide of coolies down to the Cheung Mee's shop, and there Cheung Mee's daughter, Mee Lang Fu, would meet him with her pretty birdlike chatter and the flutter of her white hands like almond petals. There would be no reproach but only disappointment in her long veiled eyes—for Mee Lang Fu dreamt of the time when her lover should take her away from the life in her father's shop, away to their own little farm in the Middle Kingdom where always the skies were blue and flowers grew and lovers had no interruptions. But how could Ah Lum ever buy a farm on the riverside with flowers and ever-abiding happiness if he would not save his money—even with the help of the dowry that Cheung Mee must grudgingly give the prospective bridegroom? So she would take her guitar and in her soft high tones she would sing to Ah Lum and he would promise to try again.

But again he had failed. That afternoon he had drawn his week's salary and had set off with resolute tread to overcome the temptation. But on his way to Cheung Mee's shop he must pass the gambling house, and all the way he had thought "but surely I *must* win to-day if I play, and of a surety if I do not play to-day, knowing that I must win, I shall reproach myself for ever."

As he approached the Sha-Tin Tea House his hot resolution cooled and wavered, and his steps faltered as he heard the "click clack" of the counters within. Finally they crumpled and fell as his eyes glimpsed the tables through the open windows, and he had gone in.

Alas for his premonitions of good fortune. The joss were against him and he had lost all. Now he had come with weary steps to the dragon shrine for meditation and thought.

Presently he rose and, walking down the hill, flung one or two of his last remaining cash to an old crone for some joss sticks, then entered the low smoke-grimed door of the wayside temple. It was so dark within that he could scarcely see anything besides the big smiling Buddha lit in the wavering flame of the joss sticks. As he coughed in the smoky atmosphere to clear his lungs his eyes gradually became accustomed to the gloom and he perceived the aged priest squatting upon his bony hams in a shadowy corner and inhaling the vile fumes of Cantonese tobacco from a bamboo pipe. The collection of scanty robes in which the old man had wrapped himself gave him rather the appearance of a bundle of rags thrown in the corner. He was quite bald, and his queer slit-like eyes, set close together in his monkey bearded face, gave no indication that he had observed the entrance of his visitor. A rat scampered across the floor in front of him—but he sat immobile and silent.

Ah Lum touched forehead, lips and heart in the Oriental greeting and waited for the old priest to speak.

Presently the old man raised his head. "Sit, young man" he said, "and tell me your lover's tale of woe."

Ah Lum, nothing loth, squatted thereupon beside the old priest and poured forth the tale of his worry, his love, his temptation, his striving against it and his repeated failures. He concluded by asking for a devil charm against the gambling house—or better still, a charm against his persistent ill-luck.

The old man sat in silence for a long time after Ah Lum had finished. So long, in fact, that Ah Lum feared he might have slept all through the sad tale. But presently, after what seemed an age to his patient listener, he inhaled a few puffs from his vile smelling pipe and spoke.

"Go you," quoth he "Oh foolish lover, this day week with your earnings, yet once more to the tea house at Sha-Tin. Stake them at whatsoever game you will and the gods shall be on your side."

Then, once more, he lapsed into silence and Ah Lum groped his way into the open air. He breathed deeply as he found the door, drinking the sweet scents of the evening down to the bottom of his lungs. His heart was filled with new hope and he ran down the hill to tell Mee Lang Fu of the glad news the priest had spoken.

At one entrance to the shop he met Cheung Mee who greeted him affably—so affably indeed, that Ah Lum was moved to suggest a payment of his daughter's dowry on the spot. After considerable argument and wrangling, without which no Asiatic financial transaction is complete, Cheung Mee agreed to give him half of what he originally asked, which, considering Ah Lum had demanded three times what he expected, was not at all bad business.

Then he burst in and told the story to Mee Lang Fu. In view of this certainty of winning at the tables, he explained, as foretold by the priest, he would stake not only his usual weekly wage, but her dowry also.

Mee Lang Fu was a little frightened and filled with forebodings of evil, but Ah Lum would hear none of it. He *knew* that he would win—the priest had said so—and he quietened her fears with little caresses until she too was filled with confidence. Together they sat long into the twilight weaving lover's stories about their little home-to-be on the banks of the River of Fragrant Streams.

II.

The next week passed in a flash; days and nights for Ah Lum were alike, for the whole twenty-four hours he dreamed of his Mee Lang Fu, of pouring a shower of dollars into her hands, of their wedding, the feasting, the dances, the songs, music, fire crackers and finally their dream of happiness come true at last.

Finally came the day when he received his wages. Placing them with the dowry money he strode into the Sha-Tin Tea House and jingled the bag before Kwong Ling, the owner.

"See," he cried, "I have come to win back all I have lost this year and more besides."

Kwong Ling's slit eyes gleamed craftily in his fat yellow face as he saw the money, he welcomed the young man with beaming smiles showing gold-filled yellow fangs behind cruel lips. He set a glass of samshui before Ah Lum and rubbed his hands at the zest with which the lover flung himself into the game.

Ah Lum played high, with a fire of enthusiasm which burnt higher as the game proceeded—for he was winning. He knew it—the priest was right—the gods of chance were on his side. In two hours he was the highest winner in the room, and the other players gradually backed out one by one until only Kwong Ling and Ah Lum were left alone among the piled counters.

The latter pushed back his high stool from the table and rose with shining eyes. He had, as he had prophesied, won back all that he had lost and more beside, and now in the leather bag was enough silver to buy the farm and bring the dreams of himself and Mee Lang Fu true at last. Kwong Ling regarded him craftily, his slit eyes almost invisible in his puffy cheeks.

"Come," he said persuasively, "you are a young man of fire—and the devils are with you—let us play on a little more—see!" and he turned and unlocked a chest, bringing forth a canvas sack which chinked most musically and whose gaping mouth showed a gleam of silver.

Ah Lum hesitated. He did not want to try the gods too highly. Kwong Ling started to talk of the expenses of a wedding with its attendant feasting and entertainment, the cost of hiring jugglers and dancers, conjurors and fortune-tellers, besides the innumerable beggars in the train of a wedding in China Town. A young bridegroom like Ah Lum would want to do the thing decently. A feast must be a feast and not a cheese scraping. He carried on in this strain up to a certain point, gauging his wavering listener to a nicety. Then——

“Of course, if Ah Lum is afraid of losing——” he commenced, closing the neck of his canvas money bag.

Ah Lum reseated himself at the table, his youthful man's pride had been stung. His gambling honour had been challenged. He would play this fat villain until dawn if necessary to show that Ah Lum was no coward at the tables.

An hour had passed when Ah Lum flung his last dollar sullenly on the table to be gathered in by Kwong Ling's podgy claws with their long dirty nails. Then he sat staring wild-eyed at the wall while Kwong Ling lit a cigarette, watching him beneath lowered eyelids the while a cruel smile curved his hard mouth.

Thoughts rushed in a mad succession through Ah Lum's mind as he sat there—fool that he had been to try the gods so high—fool and fool again—everything gone, every single cent, and Mee Lang Fu's dowry and Mee Lang Fu and all his dreams—gone through his folly. His hands were hot and clammy and yet his head felt frozen, felt as though it did not belong to his body. It seemed as though he could not move, as though a giant hand held him rooted to his stool, staring there at the wall. There was a roaring in his ears—those flying devils of foreigners with their winged machines on the aerodrome across the road. Suddenly he tore himself from his stool and staggered across to the door. Kwong Ling was lighting a vile smelling oil lamp on the table, illuminating the room with its little stools and bamboo-legged gambling tables, its Chinese legends printed on linen hanging from the walls, its grotesque pictures and queer carvings looking fantastically alive in the yellow flickering light.

As Ah Lum reached the door the flame of the lamp glinted dully on the steel blade of a long-handled axe, used for chopping and trimming bamboos. It hung, ready to hand, upon a nail in the corner.

He turned and looked at Kwong Ling.

The fat keeper of the gambling den sat with his back to the door, crouched over the table and counting the silver coins into the bag. The chink of the metal maddened Ah Lum—the money was his—it belonged to him and to Mee Lang Fu. This devil was tying his dreams into a canvas bag—burying them for ever. Ah Lum's eyes blazed at the thought—he took a stealthy step back into the room.

He saw Kwong Ling's great shadowy bulk blackening the wall behind him, he saw the yellow lamp-light shining on the bald yellow head, on the fat greasy rolls of flesh at the back of the neck.

Ah Lum's burning eyes narrowed, his lower lip trembled as though he would cry out, while the upper curled back over his teeth in an animal snarl.

His hand sought for and found the axe, and the yellow knuckles whitened as his fingers clenched fiercely about the haft.

III.

"Dammit," said the Flight Commander, easing himself in his Sutton harness and peering over the side at the shipping in Hong Kong harbour. "Is she never going to get a move on?"

He glanced round at the four machines flying in formation on each side of him, waved one on the starboard side in closer with an impatient gesture of his gauntleted hand.

The five aeroplanes swept round in a circle above the Whampoa Docks and once more commenced their patrol awaiting the movement of the cruiser, bearing some important potentate away from his visit to Hong Kong. There had evidently been some hitch in the proceedings, for the escorting aircraft had now been in the air two hours and, as far as one could see, the cruiser had not even weighed anchor yet.

The tropical afternoon was drawing to a close and, knowing from bitter experience how little twilight there was to be expected before the fall of night, the Flight Commander was worried.

He had under his command two newly-arrived young pilots from England and the aerodrome was not over large even for landing on in daylight, let alone at dusk.

He glanced at them as they flew along beside him, their silver machines rising and falling gently in the air tide. He saw each begoggled leather helmeted head staring back at him, intent only on keeping station behind their leader in the bumpy sky.

"Dammit all," he said again, looking at his watch, "I'll give them ten minutes more and then send those two youngsters back."

About five minutes after his decision the cruiser weighed anchor and proceeded slowly out of the harbour to the accompaniment of sundry gun salutes from the forts, cheering from the other ships in the harbour and patriotic tunes played by the cruiser's band. All these noises of departure were, of course, quite unappreciated by the five watchers in the darkening sky.

Ten miles out to sea the Flight Commander considered his escort duties over and, having dived his formation in salute to the cruiser.

turned and set a direct course over the mountains to the aerodrome. The last red upper limb of the sun was sinking beneath the western horizon, and even now low in the sky came the first evening star. Flying at dusk is rather extraordinary. Things on the ground are commencing to become indistinct, but the mind refuses to believe that the eye cannot still see. It is the same kind of self-hypnotism that occurs when driving a car about lighting-up time. One wonders why the lamps are necessary when the road is so apparently still, clear and distinct.

However, they had not far to go and twenty minutes later saw the five machines roaring down across the Sha-Tin Pass which lies just north of the aerodrome. The light was now very poor—that known as the “dimpsey” in certain parts of England—and the Flight Commander lost no time in giving the signal to break up the formation and land. He himself went down first and made a beautiful three-point landing on the sandy aerodrome. As he turned to taxi up to the hangars he noticed that the houses in the Chinese city had commenced to light up their lamps. He saw the windows of the old Sha-Tin Tea House gleaming with the yellow oil lamps inside. He switched off his engine and climbed out of his machine on to the tarmac to watch his four pilots land.

One was already on the ground taxi-ing slowly up the aerodrome in a cloud of dust. A burst of engine attracted his attention to the second which had undershot slightly and had to make use of extra power to reach the landing-ground. However, he too was now successfully on the ground and was turning to taxi up the aerodrome. Two down safely.

The third came in to land too soon after the second, and at the last moment of flattening out observed that he was gliding straight into the other machine taxi-ing out of the way. A collision seemed inevitable, when the pilot of the third machine observed the other ahead of him. He opened his throttle and pulled up above the other just in time to avoid him. More time was wasted while he went round again to approach into wind for a second attempt. This time there was no obstruction and he, too, safely landed on the aerodrome. Three down.

The fourth aeroplane, meanwhile, had been flying round in the deepening gloom awaiting his turn to land. The pilot, who had not long arrived out from England, strained his eyes down into the fast fading light watching the other machines land. After what seemed an age the aerodrome was at last clear. He throttled back his engine and commenced to glide down. He was fairly young and the thought that all the other pilots would be watching him and criticizing probably increased his nervousness, induced by the difficulty of darkness.

In any case, he overshot. That is he misjudged his height above the aerodrome and was still gliding at about a hundred feet when he passed the centre of the run-way. He opened his throttle and went round again. It was now so dark that the watchers on the tarmac could quite easily see the blue-white flames exploding from his exhaust ports.

Again he came in with too much height and opened up his throttle to go round again.

The third time he was determined to get on to the ground, and, finding himself once more much too high above the ground when approaching the aerodrome, he endeavoured to side-slip a little of his surplus altitude. Whether it was the darkness or whether it was nervousness, it is difficult to say, the possibility is that he had the nose of the machine pointed downwards overmuch. At anyrate, he eventually pulled out of his side-slip about ten feet above the ground with an air speed of about a hundred knots, and consequently not a hope of landing in the short three hundred yards of sandy aerodrome.

He did bounce his wheels once on the ground, and then the watchers saw his shadowy shape surge up into the darkness again. For a short moment they heard his engine roar into life once more, then there was a "crash" and the light in the Sha-Tin Tea House was seen to go out. They all started to run down the aerodrome.

IV.

A few days later, in the local newspaper, there was a photograph of an aeroplane nestling in the roof of a tea house. Beneath it was the following:—

"The above photograph portrays the unfortunate air accident on Friday night last, when an aeroplane crashed into the roof of the Sha-Tin Tea House. The pilot of the aeroplane was uninjured, but Kwong Ling, the owner of the tea house received a serious head injury from which he died the same evening."

By a curious coincidence, on the same page of the newspaper were two other photographs of a picturesque Chinese wedding ceremony held in the old walled city of Ching Kau, the bridegroom being one Ah Lum, a recent employee in the Yee Sang Fat cracker factory, and the bride a pretty daughter of a shop owner called Cheung Mee. The wedding was run on lines most magnificent and lavish.

KAMPALA

Kampala !
Green turretted, behilled,
Those gracious gifts of God,
At sight of which an airman thrilled
His wheels to rest on sod.
Queen of Afric common land,
Would I held thy golden hand
To rest with peace by thee
In mine iniquity.

Livid. Virile. Actuate
By men of vision who relate
The alpha of their vortex whirl
To business and eddyswirl,
Thy stillness swells in silent song
Like dread of pause mid noisy throng,
The echo of an eisteddfod.
Oh, Ichabod ! Oh, Ichabod !
A call to never sound
About thine own Pactolus ground.
For thou hast made and surely won
(With such delightful town)
Proud place within the vital sun,
Beneath Imperial crown.
Equatorial situate,
Thy centre is the air of fate,
To answer loud the Southern call
Of speed through savage Delphian hall.
Most favoured wife
Of mandate native life !

But do I dream aright,
That set nearby thy natured height
I see in contact with our home
A famous aerodrome ?
What is this gathering ? Whence and why
So many thousands passing by ?



GOOSANDER SITTING.



YOUNG GREENSHANK.

Such riches there for me to see,
And pageantry?
What are those craft that nobly stand
To carry produce of thy land:
The people, mail, and goods
Direct from dark Ugandan woods,
To where 'twill be of use they say?
Come dawn that day!

And yet there strikes a note
That vibrates where 'tis more remote.

What are thy terms of reference here?
Art thou alone and have not fear?
Is colony protectorate?
And where the reigning master mind
(Whom folly says they would be kind)?
What policy doth them dictate?
Does not the word of London count?

And from whose land doth spring the fount?

Kampala!
Green turretted, behilled,
Those gracious gifts of God,
At sight of which an airman thrilled
His wheels to rest on sod.
Queen of Afric common land,
Would I held thy golden hand
To rest with peace by thee
In mine iniquity.

H.-W.

THE AIRMAN OF THE WATCH

Let us raise now our glasses, this Pentecost,
To the fellow whose job is to see we're not lost :
Whose instructions compel him to give information
Of the weather for aircraft at their destination.

With a nay nonny no
And a no nonny nay
He is waiting to see if we all know the way.
With a no nonny nay
And a nay nonny no
He is waiting to see if we know where to go.

Lack of judgment when flying too near he reports,
And when seeing wrong circuits (bad flying of sorts);
Since he stands for control, and he represents why
We are able to succour who might otherwise die.

With a nay nonny no
And a no nonny nay
He is waiting to see if we all know the way.
With a no nonny nay
And a NAY! NONNY!! NO!!!
He is waiting to see if we know where to go.

Undeniably, where is the pride of our force?
Just reliably there, in the watch hut, of course!

H.-W.

GAMES AND BRITISH CHARACTER

BY "MENTAX."

MANY centuries have passed since Aristotle and Plato discussed psychology. Since then their disciples have gone forward, and, although investigation during two thousand years has, in reality, resulted in very small progress in the diagnosis of national character, yet a sound foundation had been laid. It was the war which forced men in general to recognize the importance of the psychological method. Classical education had not provided adequate data for the determination of the character of nations, and, in consequence, of their conduct.

To-day we know that it is the psychological factors which determine the future of nations, and that a nation's destiny is woven in the minds of men.

It is in this light that I propose to examine the foundations of the British character, and the possible dangers that lie ahead. There are three outstanding characteristics in the British national character, a perfectly natural inclination to abide by the law, a sound and well-balanced judgment, and the capacity to rule. That sixty thousand Britishers are able to control three hundred million natives in India is due to certain qualities of character not possessed by others. In the course of history, the nations, like the animal and vegetable species, have acquired characteristics which make it possible for us to classify them. One has to remember, however, that the recognisable characteristics are those fixed by heredity, and that circumstance and environment can modify the acquired characteristics.

The elements in the British character, already referred to, have their origin in a stable mental equipment. Such an equipment postulates internal discipline, which is the foundation of unconscious morality. Nations which do not possess it need external discipline, sufficiently energetic to guide them in their social life. They need a powerful leader and, with his disappearance, sink back into mediocrity. The destiny of such a nation lies in the minds of its rulers, rather than in the minds of the nation as a whole.

How have we acquired this stability which makes us like the Happy Warrior of Wordsworth? The answer seems to lie in the physical upbringing of the country's manhood. I say "physical upbringing" advisedly, as the actual form which the upbringing takes is a separate matter, bearing its own influences on character. We want to examine

for a moment the influence which physical exercise has on the mind. We, all of us, come into the world with an innate tendency towards play. Every child plays. It is nature's method of preparing us and training us for the rapid and intricate movements necessary in later life. Play is a physical exercise of recapitulation, which develops the working of the mind, and enables the creature to become better fitted to deal with its environment. It is not that the young play because they are young, and are possessed of superfluous nervous energy! A kitten prefers playing with a ball on the floor. During the course of such play the kitten improves its skill in the movements of the kind which it will need to catch its prey.

Physical exercise in childhood, therefore, has its own special purpose, but when it is continued in youth in the right way, *it builds up a sound muscular system which gives a sound support to the nerves* and so leads to a *normal* and alert mind. It is quite impossible to over-emphasize this point in the building of the British character. The nature of the exercise, *i.e.*, the games, will have its influence in the creation of a "team-spirit," or of selfish individualism, but the fact of basic importance in the building of the British character is that the majority of Britishers grow up with a sound nervous system, the result of healthy exercise. Sound and steady nerves are an essential to a stable mental equipment, and to sound judgment. Having served its purpose, however, athleticism *can* become a menace.

When one comes to a consideration of the games played at British schools, and their influence on the national character, we are faced with two different types of games. The games such as cricket and football; team-games, which, while preparing the players for social life, tend to encourage the postponement of individual to collective ends. The other type of the outstanding example of which, to-day, is tennis, a game which encourages selfish individualism. Whoever it was that invented the team-games laid the foundation of our national character. Now team-games foster the sentiment of *self-regard*, which is a development of the love sentiment. Without that self-regard, a strong character will never be built up. It is just this that sums up the "public school spirit"—self-regard; we are taught to take a pride, not only in ourselves, but in what is ours collectively. It is true that some do the right thing only because of *what others will think*, but in the majority of instances the lower plane merges into a higher plane of moral development later, when the individual does a thing because he thinks *it would be wrong* not to do it. The "courageous attempts of late to expose the myth of the Public School spirit" are so much waste of breath. This spirit exists, and, regarded from a psychological point of view, is at the very root of the British character. McDougall, that eminent psychologist, speaking of *Play* says:

"athletic contests and games of all sorts, not only exert among us an important influence in moulding individuals, preparing them for social life, for co-operation, for submission, and for leadership . . . but also are playing no inconsiderable part in shaping the destinies of the British Empire, by encouraging a friendly intercourse and rivalry between its widely scattered parts."

Here, then, we come to the very foundation of the British character. We have, first, a solid and sound nervous system which means an unemotional mind, with a sound judgment. Abnormal, neurotic people are the exception in the British race. Upon this finest of all mental foundations we find that the nature of the games teaches co-operation, submission, leadership, and endurance, which result in restraint, in optimism in defeat, and the observance of rules; in fact, a stable mental equipment. The foundation and its superstructure result in an edifice—a lighthouse—which can withstand the stress of the wind and the waves of the storm. It is games such as these that must be continued—that must be encouraged at all costs. The games, such as tennis, which encourage individual super-excellence are to be condemned in the youth of Britain. It is only necessary to live in the atmosphere of tennis players and of a tennis club tournament! Each one for himself and the cup that may be won. As Peter Powell puts it, "And yet, with all their littleness, they honestly imagine that they are the salt of the earth."

" 'In men this blunder still you find
All think their little set mankind.' "

Naturally there are exceptions, and they are found amongst those who were brought up on team-games and developed tennis after the "edifice" was completed. Abroad, where, until recently, the gymnasium was the principal form of exercise, one finds this individualism strongly developed. It is a characteristic of many foreign races, which, in virtue of the fact that they *do get* physical exercise in childhood, are comparatively stable, and yet lack that internal discipline and "team-spirit" characteristic of the British. At the other extreme we get races such as the Mongols and the Russians. Here there has been no regular physical exercise in childhood, and no games which inculcate the "team-spirit" to the destruction of a selfish individualism. The result shows itself in the totally unstable character of the race. When they have known prosperity it has been ephemeral, since it was dependent entirely on a leader of sufficient strength to transform a horde of inconsistent minds into a solid mass. With his disappearance the mass has dissolved, to become once more an unstable sea of inconsistent minds.

Our physical exercise, and the nature of that exercise in the shape

of our games, has given us a stable mental equipment which makes us amenable, as a nation, to discipline, and has been a first-class education in the forming of *our national character*. It is worth remembering that no amount of reading and repetition of text-books and manuals can transform the soul of a nation, or of a generation. How much more important is it to see to the education of character than to the education of the mind!

It is now, at this stage of the world crisis, that the British character, acquired in the centuries that are gone, is showing its worth. A bewildered world is finding itself passing from riches to poverty. Yet, through this bewilderment, there is a strange and universal wonder at Britain. Calmly and serenely we set our teeth. We breasted the oncoming torrent without a whimper. Without that "internal discipline" I spoke of this would have been impossible. Other countries are looking towards each other with suspicion, but at us they look to-day with hope and faith, and a belief that we "can see it through." It is the British cult of games which has strengthened in a remarkable degree our natural capacity for "seeing it through." We lose interest in a game once we are winning easily. It is then that we begin to "muddle." When, however, a victory has to be won, which looks like being snatched from our hands, then the national character, built on the playing-fields of Britain, makes itself felt. Our whole national upbringing makes it possible then to say, "I will," instead of listening to words "you must."

It is remarkable that the application of the psychological method constantly reveals the fact that in the realm of human life, just as in nature, the tiny insignificant raindrops form rivulets which ultimately become vast rivers. What is there in a game? Cricket, football? Yet, played in the backyard, on the village green, at Eton or at Lords it is these games that have helped to fit us for leadership in world affairs to-day.

Will it continue thus?

I venture to suggest that there are indications that a change is occurring, a change which must be watched and stopped. The danger is psychological and, in consequence, vital. The moral forces which control our national character to-day lie in the past, as the plant results from the seed. The present and the future rapidly become the past, and therefore both are of the greatest importance. We have drifted into the age of the machine, and with it has come a tendency to strive unscrupulously for efficiency. With the machine has come infinitely superior means of transportation, and inter-communication; with all these has come the means of watching others play instead of playing. Instead of being able to look back with enjoyment on the boundary made into the duck-pond on the village green, there is a tendency

to go by the twopenny bus to watch others play, or to smoke endless cigarettes in a cinema. If this matter is allowed to pass unchallenged *we* can still smile, but the generations to come will lack that muscular tone which is the support of healthy nerves and so of a stable mental outlook.

Unfortunately, games are becoming commercialized; cheap and easy transportation has made it possible. To make the "exhibition" pay the players must be worth watching. Efficiency and money become all-important and the ancient glory of sport is dying. The space devoted to sport in the Press is amazing. Players are accorded civic receptions. The defeat of one county by another is treated almost as a national calamity. Business houses are rewarding outstanding individual performance by substantial gifts. These things are pointers of the trend of the modern idea of sport. They would not be so serious if they did not have an influence on the youth of the country. It is a well-known fact in psychology that youth likes to do a thing because "it is done." The innate tendency of imitation is very strong in youth. With the overwhelming stress laid on *efficiency* in games to-day, and the prominence given to *individual effort* in a variety of ways, it is only natural that British youth, endowed with the spirit of rivalry, should try to emulate their heroes.

We do not want *super-efficiency* in our games. Physically it leads to strain: morally it leads to individualism—a menace to the national character. As long as our games are played naturally and joyfully, and are given their proper value in our lives; and, as long as the majority play them in the right spirit, all our team-games will continue to stimulate the growth of those characteristics peculiar to the British character. Once allow commercialism and the god of Efficiency to degrade the spirit of our games, and we shall find a slow process of corruption rotting the moral soul of our race.

TIGER HUNTING WITH THE HELP OF A "DAILY MIRROR"

BY GROUP-CAPTAIN A. A. WALSER, M.C., D.F.C., *p.s.a.*

IN the summer of 1928 I obtained permission to shoot a forest block in the Chanda area of the Central Provinces. The block was known to be a happy-hunting-ground for tigers, but was difficult to reach and was only very sparsely inhabited by a primitive race of Indians who spoke a language called Telegu, which neither I nor any of my servants could understand.

However, in the centre of the block there was a forest bungalow which was in fairly good state of repair and was in charge of a Chowkidar*, who could understand Hindustani and could even make himself understood to my cook, Ali Ahmed, in an elementary form of this language.

I decided to make the bungalow my headquarters and to use the Chowkidar-cook combination as the means of conveying my wishes to the natives.

I was unable to obtain the services of a shikari† and so was forced to make all arrangements myself. This was no easy matter, since the natives were a most peculiar lot; full of prejudices and superstitions, they would turn up on one day for a beat in unlimited numbers; but on another would leave me severely alone, even after every inducement in the way of extra pay had been offered. This irritating behaviour was probably due in part to local superstition: in part to the fact that, some years before, a white man had conducted a beat in this area, during which two beaters had been fatally mauled by a wounded tiger. Fortunately for me I had two faithful retainers besides my cook whom I could rely upon to help. The first of these was my bearer—a Pathan—who considered himself a cut above anyone else, except a Sahib, and was careful to let everyone know it. The second was my orderly, who, though not very well endowed with brains, was loyal and brave. Ali Ahmed, my cook, if he was not very courageous when it came to dealing with man or beast, could at least be very useful in acting as interpreter when this might be done from some safe point of vantage.

My block was a large one—several miles square—and I had seven or eight bodas‡ tied up in various suitable places. Every morning

* Native night-watchman.

† Professional native hunter.

‡ Young buffaloes.

I used to rise about four o'clock, just as the dawn was beginning to thin the opaque darkness of the jungle. At this moment there was often a cool breeze which was very welcome after the damp and heavy atmosphere of the night. My first task was to go round the bodas to ascertain whether they had been approached by a tiger, but this could not be done before about seven o'clock for fear of disturbing the tiger before he had settled down for the day. It was, of course, impossible for me to go the whole round myself since some of the bodas were seven miles away on the far side of the block, while others were scattered at the northern extremity which was fairly close to the bungalow. I generally used to examine opposite sides of the block on alternate days, taking turns with my orderly, who, with a certain number of local natives, inspected the bodas which I could not reach. This long tramp before breakfast, in a temperature which was rarely much below 90 degrees in the shade, was no light undertaking, but I knew that when there had been no kill I should be able to rest during the heat of the day.

I had a kill during my first week, and having been able to obtain the requisite number of beaters, and everything having gone off satisfactorily, I was lucky enough to bag a very fine tiger.

I must explain here, that, for the writer at any rate, the fascination of tiger hunting by means of beating lies chiefly in planning and organizing the beat, and not so much in actually firing the shot. The " King of the Jungle " is an uncanny animal and does not always act according to plan; but he does generally follow certain lines of conduct. Having killed an animal during the night, a tiger will usually carry or drag his prey into thick cover, where he will have a meal. When he has satisfied his hunger he will proceed to water and have a drink, and then, more often than not, will return and lie up in the vicinity of his kill.

This habit of lying up in the vicinity of the place to which he has dragged his kill is taken into account when arranging a tiger beat. The hunter knows roughly in what direction the tiger has dragged his quarry, though he cannot, of course, approach the place without the risk of disturbing him. Were he to do so it is probable that the tiger would slip away quietly and possibly never return.

The nature of the country surrounding the area in which the tiger is suspected to be lying up, has to be considered when arranging the strategy of the beat. The tiger dislikes sunlight and will generally not move across an open space unless he is forced to do so. If disturbed, his inclination is to slip quietly through the jungle towards thicker and deeper cover. A beat should, therefore, be conducted in such a manner as to disturb the tiger and make him want to move away without startling him. Then, once he is on the move, he should

be urged on in the direction of his natural inclination. His route (to which he is forced to adhere by the stops if he shows his intention of deviating from it) should lead to within easy range of the hunter who has been posted in a suitable position—generally on a tree.

The selection of the best position for the machan,* and the placing of the stops, is perhaps the most important part of the whole affair. The machan should afford a good view of its immediate surroundings, and must command the avenue of approach which the tiger may reasonably be expected to take.

The stops, who are generally "raw" natives, must be placed on trees which skirt the tiger's avenue of approach, so that if he shows signs of wishing to take another route than that which will lead him to within range of the machan, he will be dissuaded from doing so by the stops. The latter are instructed to keep as quiet as possible, and to do nothing if the tiger passes them going in the right direction. If, however, the tiger comes towards them, going in the wrong direction, the stops are supposed to tap their tree. This normally is quite enough to turn the tiger, who is extremely suspicious of any unfamiliar noise.

All this may seem easy enough to the reader; but, alas!—as many a sportsman has discovered to his cost—there is many a slip twixt "kill" and tiger.

The tiger in the first place is an animal with incalculable reactions. He will not allow himself to be driven in a direction in which he has made up his mind that he does not want to go. His reluctance to do what the hunter wishes may, possibly in some cases, be due to the fact that he has had an unpleasant experience on a former occasion.

Then there are the "helpers." These are generally natives of a very primitive class, who are full of prejudices as regards the way in which a beat should be managed and of superstitions regarding the tiger. The stops, after being carefully placed on their respective trees, will often clamber down and proceed to climb another tree already occupied, probably because they feel safer with a companion; or they may start coughing and spitting or calling to each other, as soon as the Sahib has departed. I once even knew a stop who, when he saw a tiger, was so startled that he fell off his tree with the result that the tiger broke back through the line of beaters.

But all this is merely by way of introduction to the present story.

The incident which I am going to relate was brought about by a set of circumstances of which I was entirely ignorant at the time.

My bearer, who, as a Pathan had a terrific reputation for ferocity

* A small platform made of branches which is fixed in a tree, and on which the hunter takes up his position.

amongst these down-country dwellers, had so over-awed the neighbouring village, that its inhabitants fled at his approach. I also discovered long after the event that on one occasion he had beaten the postmaster, who acted as official spokesman of the village, for not supplying sufficient chickens for the requirements of my table. These and other misunderstandings between my staff and the "big-wigs" of the village, which lay some seven miles away on the other side of the jungle, were soon to have serious consequences.

One morning, on going the round of my bodas, I found that one of them, which had been tied up in the bed of a dry water-course, had been killed and removed. It was easy to reconstruct the scene that had occurred during the night—the story was written in the sands; one could see the point from which the tiger had first seen the boda; the tracks showed clearly how he had stalked his prey, and how at last he had leapt upon the terrified animal. The pugmarks showed that there had been a large tiger at work; but it also appeared to me as if there had been a second tiger in the vicinity, although it was difficult for anyone but an expert tracker to disentangle the medley of tracks round the site of the kill.

Immediately I saw that I had had a kill, I sent a messenger to the village seven miles away to ask the head man to send me 100 men as beaters as soon as possible. I then began to carry out a careful reconnaissance of the neighbourhood. I dared not, of course, approach the area in which I suspected that the tiger was lying up, but I climbed the tallest tree in the vicinity so as to try to obtain a picture of the surroundings.

There was a small pool near to the kill, and it was clear that the tiger had been there to drink after his feed. Subsequently he had dragged the remains of the boda towards the bank and then up a small side nullah. I followed this up, and found various gruesome remains in the undergrowth, but dared not push my investigation any further for fear of disturbing the tiger.

Right along the banks on either side of the river-bed stretched a thick bamboo jungle ranging from 1,000 yards in depth to 100 to 200 yards across.

The site for my machan I decided was to be at a point some 1,200 yards further "up-stream," and, on the far side, that is to say, on the opposite bank to that up which the tiger had dragged his prey. I selected this position, although it was on the opposite bank, because I suspected from the general lie of the country that the tiger, when disturbed, would cross the nullah into thicker jungle at a point where the river-bed narrowed and took a sharp bend.

I must explain here that the success of a beat depends largely on the hunter's appreciation of what the tiger's movements are likely

to be after he has been disturbed. As I have already explained, however, the tiger is an animal of incalculable reactions, and I had, therefore, to guard against the eventuality of his creeping along the right bank and so avoiding my machan.

I made up my mind to do this by placing a row of stops across the jungle about three-quarters of the way to the machan so as to force the tiger to cross if he had not already done so.

The machan having been fixed in position I reconnoitered and marked the various trees upon which I intended placing my stops before returning to the forest bungalow for breakfast, and to await the arrival of my beaters.

What was my disgust when, about ten o'clock, my orderly returned saying that the Postmaster had informed him that he could not send any beaters as they were all "bahut bimar" (very sick)! My orderly had been able to round up eight men on the way whom he had impressed either with threats or by promise of a large reward.

This was a maddening development! I reckoned that it would take at least 100 men to carry out this beat with reasonable hope of success. However, it was a question of abandoning the project altogether, or of carrying on with the means at my disposal on the off-chance of getting a shot.

I summed up my resources; first, there was my orderly; then my bearer, cook, sweeper, the bungalow chowdika, a forest guard, eight men collected by my orderly, three local forest natives and four small boys who happened to be in the neighbourhood—twenty-one in all!

I decided to have a try, and then suddenly I had a "brain wave." Why not newspaper for stopping?

It is a well-known fact that animals are very suspicious of anything they have never seen before, and surely a tiger would not be familiar with a piece of newspaper fluttering on a bush!

Fortunately I had a copy of the Weekly Edition of the *Daily Mirror* and, armed with this, I proceeded towards the machan.

I now started to fix pieces of the *Daily Mirror* at regular intervals on the outskirts of the thick jungle that lined the banks. I arranged this line of artificial stops in a curve, which led in the desired direction, the stops of either side narrowing to a bottle-neck containing the machan. I also placed a thick line of *Daily Mirror* stops, fixed at about the level of a tiger's eyes, on the far side of the river bed so that, as explained before, the tiger would be forced over to my side of the nullah.

The next question to be decided was how to make the best use of my twenty-one available "bodies." After a great deal of thought I decided upon the following distribution:—

	No.
Watchers to be placed behind the machan in case the tiger was wounded and went on	2
Stops on either side and about twenty yards in front of my machan to ensure that the tiger should take a central course past the machan	2
Stop below the bank to prevent the tiger crawling by unobserved	1
Stops to reinforce the barricade across the jungle on the far side of the river-bed	5
Beaters	11
	—
Total ...	21
	—

I armed my beaters with sticks and empty grape-nut tins filled with small stones, and having lined them out at intervals of twenty yards, I adjured them, on pains of non-payment, to keep in line and advance slowly and steadily. What a hope!

Anyone who, in the course of his military training, has had to teach recruits how to move in open order across country without losing their direction or alignment, will realize that, to induce the line to reach the objective in comparatively correct formation, is no mean achievement. Multiply the difficulties of this feat by twelve, and some idea may be gained of the task that confronts the hunter, especially as he can only be present at the " preliminary conference," and has to leave the conduct of operations to a native.

It goes without saying that when you have assembled your troop of beaters, you will extend them yourself, placing each man in the correct position at a suitable interval from his neighbour, and will explain to each individual by means of words and signs how he is to advance and how he is to keep his interval and direction. But, alas! in a very short time, fear will make them concentrate; and then, unless constantly put back in their right places, small groups of them will move in single file through the most open spaces, and some will even drop down gently in their tracks and enjoy an unearned rest.

This is really the main reason for employing the large number of beaters that is generally considered essential to the success of a beat. However, in spite of these difficulties it often happens that the tiger will be disturbed by the noise made by the beaters and warned of the direction from which the intruders are approaching by the sounds of spitting, talking and coughing, he will generally slip away in the opposite direction, and, if the beat has been well planned, unsuspectingly move towards the bottle-neck area lined by the stops.

On this occasion I could do no more than place the bearers in position myself with my bearer in the centre of the line, my orderly on the outer flank, and hope for the best.

I now told my bearer to wait for twenty minutes before he gave the signal for the beaters to start, so as to give me plenty of time to get back to my machan, carry out a final inspection of the stops and take up my position. I then made my way by a circuitous route to the machan, where I found that my two near stops had both got on to the same tree. This had to be put right as silently as possible before I climbed up into position.

For about ten minutes nothing much happened. Unfortunately, owing to the absence of large trees, I had been forced to place my machan on a fairly slender tree, with the result that it was swaying about in the wind like the crow's-nest fixed to the mast of a ship at anchor.

As the line of beaters drew nearer there was an increasing amount of life in front of me. Every now and then I would see the small black glittering eyes of a peacock peering out of a bush; jungle fowl would slip by; and then the monkeys came helter-skelter, jumping from bough to bough, many of them carrying youngsters who appeared to be having a rough passage.

Suddenly there was a commotion on the right flank, all the stops placed across the jungle on the far side of the nullah starting to clap violently. This was followed by a loud coughing roar as the tiger—or rather tigress, as it turned out to be later—broke from cover and charged across the river-bed towards my side. I caught a glimpse of her in the distance as she galloped across the sand with her tail in the air, a picture of startled fury.

This interlude was followed by a silence which seemed interminable. Imagine my excitement as I pictured the tigress creeping towards me and thought that at any moment she might break past me with a roar.

But, suddenly, without noise and without my having become aware of any movement, in front of me I saw a large yellow head peering out from between two clumps of bamboos.

The tigress, whose head appeared incredibly large, blinked up at a ray of sunlight and then took a step forward. As she did so I fired at the centre of her neck, and she collapsed without a sound. Before I could reload there was a rustling sound in the bamboos, and a second tiger, much larger than the first, appeared. I fired my second barrel, aiming at almost exactly the same point. The tiger gave one convulsive bound and then dropped not five yards from its mate. Only a convulsive movement of the tiger's tail showed me that it was still alive though practically dead—and in a second or two it was still.

I clambered painfully down from my machan and only then became

aware of the fact that my face and hands had been a happy hunting-ground for countless insects.

The beaters arrived and started a rather hysterical dance round the prostrate forms of the royal pair.

But there was a great deal of work left for all concerned, and we first of all set to work to make stretchers upon which to carry back our trophies.

The tigers were then carried back in procession with much singing and shouting, and were deposited on a carpet of leaves in front of the bungalow. I now first of all marked each tiger out carefully with an indelible pencil so that the skimmers should not ruin the skin. The Chamars (as the skimmers are called), are rough-and-ready workmen and have to be watched carefully. All the delicate parts such as the head, pads, and tail I had to do personally, otherwise they would have been ruined. Each whisker had to be separately extracted and preserved, otherwise it would most certainly have been stolen, because the natives value them very highly. They use them either as a slow but certain method of getting rid of their enemies by chopping them up and mixing them in food, when their barbs stick in their enemy's intestines, eventually causing an inflammation which generally ends fatally; or, they grind them up into very fine powder which they eat in the expectation that it will endow them with qualities of ferocity and strength possessed by the tiger.

We worked late into the night in the light shed by battis.* It was a weird scene. The chamars, squatting on their haunches, muttered over the bodies as they laboured at their messy job, chewing pieces of raw tiger fat which they imagined to be a cure for all ills, both of the body and of the spirit. The weird light thrown by the flickering lanterns lit up a small circle which stood like a stage out of the blackness.

From the surrounding jungle came a series of moaning roars echoed now and then from the distance; was it a new pair of tigers already on the way to occupy the area left unpossessed by our hunt of the morning, or was it really the spirits of the dead calling to each other and vowing vengeance on the slayer?

I worked till 3 o'clock in the morning, by which time I had been so bitten by mosquitoes that I felt I could stand it no longer. The work, however, was all but finished, and the tiger-skins were nearly ready.

They both now hang in the Mess of the Royal Air Force at Halton House, Bucks.

* Lanterns.

WILD BIRD LIFE INLAND OF CAPE WRATH

BY FLIGHT-LIEUTENANT B. H. GODFREY.

A LARGE scale map of the north-west corner of Scotland shows a sixty square-mile area of Sutherlandshire, bounded on the north and west by the Atlantic Ocean, on the east by the Kyle of Durness, and on the South by the Shinary River and a deep range of mountains.

One narrow motor tract penetrates from the ferry at Keoldale to the Lighthouse and Signalling Station at Cape Wrath, but as this ferry is a one-man propelled pulling boat, the motorist is unable to take his car over. This road, eleven miles long, traverses the most desolate scenery imaginable in Great Britain; huge boulders of lava, immense tracts of squelchy bog and spagnum moss, hemmed in on all sides by sullen bare mountain peaks with tarns and larger lochs scattered indiscriminately on and between the high hill ranges. These mountains are mostly of volcanic origin, and little, if any, vegetation can manage to survive. Grouse and mountain hares are few and far between, but it is a natural breeding sanctuary for such birds as the Golden Eagle, Buzzard and Peregrine Falcon, as also for the wild cat which is found in this district in moderate numbers.

The natural food of the latter and of the birds of prey is the rabbit, and Brer Rabbit breeds in quantities throughout this region; its coloration varying considerably—brown, black, and black and white. Even on the grassy islands, further to the eastward, such as Island Hoan, this strange mix-up of colour occurs. One is used to the pleasant picture of coloured rabbits in the woods and pastures near civilization, but this sight, far remote from villages, has a distinct touch of the bizarre.

Of the small birds, the Wheatear, Stonechat, Meadow Pipit and Twite are the sole representatives. The boulders and cairns give ample accommodation for the first two named, and, as is well known, the Meadow Pipit and Twite are past masters in finding suitable cover for nest making, but not past masters in avoiding their troublesome shadow, the Cuckoo, for her presence is everywhere evident in this far corner of Scotland. The writer even spotted a female cuckoo fly from out of a hole under a boulder, and two days later found under this rock a wheatear's nest containing two eggs of the rightful owner and one of the cuckoo.



GOOSANDER AT NEST: ONE OF THE RAREST OF BRITISH NESTING BIRDS.



YOUNG GREY LAG GEESE.

Of the order Anseriformes (Geese, Swans and Ducks) the types are more numerous, with the exception of the swan.

The mute swan can be seen nesting in almost any other locality of Scotland, including the outer isles, but the north-west corner is apparently shunned by this bird during the nesting season, although the inhabitants of Durness inform me that both the mute and the whooper appear in winter-time on the Kyle in large numbers. The grey lag Goose nests sparingly, and by the first week in June all broods had taken to the waters of the larger lochs. I was surprised to locate a pair of Ruddy Sheld-Ducks swimming in the upper waters of the Kyle of Durness, but undoubtedly these birds were non-nesting and at some time wandered from private waters. I was near enough to hear their loud complaining trumpeting call. In Indian mythology there is a tale that these birds have the souls of two dead lovers who can never meet, but must for ever call to each other across the river. The Mallard is conspicuous for his absence, as opposed to the Tufted Duck, which is to be found nesting round every loch and tarn. One pair of Gadwell were nesting in a loch near the Cape Wrath Road, and I had the pleasure of seeing the brood swimming with the female on the loch. The female Gadwell is not unlike the Mallard Duck, both in plumage and note of alarm, but the black and white speculum of the former is soon distinguished if she is watched through glasses when rising in the water to stretch her wings.

Of Nesting Teal and Wigeon I could find no trace, although a few small parties of the former were met with, fighting from the moorland streams connecting two lochs. One nest of the Pintail was situated very near loch water, and consisted of five eggs, well incubated, which, in my opinion, is a small clutch for this species. The eggs were very slightly smaller than the Mallard's and of a distinct yellowy green; I was particularly struck with the conspicuous white inners of the dark brown down.

A pair of Scoter were nesting on a tiny island on a loch, five eggs composed the clutch and resembled miniature sheld-ducks' eggs. The down lining of the nest was dull light brown, and the tufts were exceptionally large. The dark yellow patch on the base of the drake's bill was very distinct when the sun was shining.

Every loch of any size was inhabited by one or more pairs of red-breasted Mergansers. The gillies around Keoldale evinced great disgust and enmity towards this species, which they stated was fast becoming too common and a danger to trout fishing. Personally I am of the opinion that this bird much prefers small sea fry, and several pairs nesting on a loch will not do so much damage as one crepuscular visit of a cormorant.

I was extremely fortunate in locating one pair of nesting Goosanders,

and more than pleased to find that the nest was situated in the open and was thus able to obtain photographs of the female incubating her eggs. The male is undoubtedly a very showy bird with his bright green black head, long thin hooked red bill, black and white wings and rosy white underparts, but for sheer delicacy of colouring his mate is superior. When viewed from a hide, at a distance of a few feet, the light blue-grey colouring on her back, her chestnut head and long mane-like crest, and thin bright orange hooked beak make her indeed a picture of beauty.

Of the order Colymbiformes or Divers, both British nesting species can be found, the black-throated sparingly and the red-throated rather more common. The bigger lochs are not really suited for the larger species, few peaty or grassy banks being available, but the high moorland pools are admirable nesting sites for the red-throated Diver. I found this bird uncommonly shy of any kind of artificial hide, and on two occasions I was forced to move this contraption for fear of forcing her to forsake her eggs. The female would come on to the peaty pond, but for hour after hour she would patrol one stretch of the water, uttering the most pitiful wails, and taking sidelong glances at my hide. At one time a Greater Black-back Gull began swooping down towards the eggs; the agitated Diver, using wings and legs, rushed across the intervening piece of water, and literally screamed at the unwelcome intruder. The great coward made off, and soon after this episode I packed up and left her in peace.

Of the wading families, Dunlins, Sandpipers, Common Snipe and Curlew were in predominance, and all were nesting. But the Golden Plover was only just arriving and, in many instances, they had not paired off, but were remaining in parties of ten to twenty scattered over the moors.

I had great hopes of locating and studying the Whimbrel at her rest, but although I spent two days with that object in view I was forced to concede best to the Curlew's smaller cousin. One of the gillies at Keoldale Hotel informed me that they nested in the near vicinity, and that only the day before a solitary bird had been observed wading on the sandy edge of a loch close to the Hotel. But I fear that I take all bird information obtained from gillies and the average keepers with a large grain of salt. The need for this reserve was shown when, a few days later, I was informed by another keeper, living further to the eastward, that a pair of Great Northern Divers had nested each year on a small rocky islet in the mouth of Loch Eriboll. Again another informant imparted the knowledge to me that a fisherman, who was deep in the lore of bird life, had recently seen a Great Auk on another rocky island. As Alice remarked, "I wonder."

The Greenshank nests sparingly in this district. Of the two pairs

that I was able to locate, only one was nesting early in June, and by the commotion they made it was evident that they possessed young. After much patience and hiding I was able to find one youngster and take his photograph. The white rump is very evident in flight, and when viewed close to through glasses the handsome light grey colouring of this bird is most pleasing to the eye. Many authorities state that this bird does not possess that excitable ducking action which is such a characteristic of the Redshank. Unless this pair was an exception to the rule I am of the opinion that this action is shared by both species.

AIR NOTES

EVENTS ABROAD.

FRANCE.

POLITICAL.

As a result of the recent elections in France, M. Herriott was called upon to form a Cabinet. He appointed separate Ministers for Air, War and Marine, thereby abolishing the newly formed Ministry of Defence. M. Paul Painlevé was appointed Minister for Air.

COMMITTEE OF NATIONAL DEFENCE.

A Supreme Committee, responsible for co-ordinating the requirements for national defence, has been established. M. Painlevé is to preside over this Committee, which will include:—

The Minister for War, Marine and Air.

The Inspector-General of Air Defences.

The Vice-President of the Supreme Councils.

The Chiefs of the General Staffs of the Army, Navy and Air Force.

The Committee will examine the questions which simultaneously concern the employment of the military, naval and air forces, their general organization, general armament programmes, and the allocation of budgetary credits appropriated to the said organization and programmes.

THE BUDGET.

Owing to repeated Budget deficits and being faced with a possible deficit of over 4,000 million francs on the current Budget, the French Government have been compelled to pass a law authorizing

(a) Cuts on the present Budget; and

(b) Economies to be effected on the 1933 Budget.

As far as the current Budget is concerned, there are no cuts on Aero-nautical Services.

For the 1933 Air Budget the present law provides for economies reaching a total of 202 million francs when compared with the estimates for 1932, calculated on a basis of twelve months. This means that the 1933 Estimates must not be more than 2,232 million francs, although the French Air Ministry recently estimated that the 1933 Budget should show a very large increase over that for 1932.

Details of the economies to be effected are as follows:—

Various headings	...	...	7 million francs			
Service personnel: pay and allowances	...	...	10½	„	„	
Series material	...	...	93	„	„	(out of 751)
Other material	...	...	33	„	„	(out of 231)
Automobile fuel	...	...	1½	„	„	
Types	...	...	20	„	„	(out of 526)
Research	...	...	3	„	„	(out of 16)
Establishments	...	...	3	„	„	
Credits for the Arsenal	...	...	3	„	„	(out of 5)
Private flying	...	...	6	„	„	(out of 13)
Cost of training civil pilots	...	...	4	„	„	
Subsidies to companies	...	...	16	„	„	(out of 200)
Enlistment and re-enlistment bonuses	...	...	2	„	„	
Total	...	...	202	„	„	

In a letter dated July 2nd, addressed to the Finance Commission of the Senate, the Air Minister, M. Painlevé, states that he is of the opinion that these economies have not been prepared with very great care. (This statement was published in the *Journal Officiel de la République Française* of July 14th.)

UNITED STATES OF AMERICA.

AIRSHIPS—U.S.S. "AKRON."

The airship, on its recent flight across the United States and return, carried a complement of aeroplanes within the hangar provided in the hull of the vessel. During the voyage, and while engaged on various flights on the West Coast, the efficiency of the trapeze gear fitted below the hull was well tested. Some 104 contacts between the aeroplanes and the trapeze were successfully carried out, six different pilots taking part in the tests. (*Press.*)

BOMBING AIRCRAFT.

A new bombing aircraft has been delivered to the Army Air Corps for test by the firm of Glenn Martin, which has up to the present been fully occupied in producing naval aircraft. The new bomber is a twin-engined low-wing monoplane, with retractable undercarriage. Performance figures have been withheld for the present. (*Press.*)

AIR SERVICES APPROPRIATIONS, 1932-33.

The financial situation in the United States is to some extent reflected in the final appropriations for the Army and Navy Air Services for the fiscal year 1933. The funds for both Services have been reduced by some \$6,000,000 each below the figures for the previous financial year, the total appropriations now being \$25,673,236 for the Army Air Corps, and \$25,382,820 for the Naval Air Service. In both cases there are large reductions in the amounts provided for new aircraft. It should be noted that these figures refer to "visible" appropriations only. (*Press.*)

GERMANY.

DEVELOPMENTS WITHIN THE AIRCRAFT INDUSTRY.

(i) *The Bayerische Flugzeugwerke A.G. (B.F.W.), Augsburg.*

After having lain idle for over a year, these works have once again resumed aircraft construction on an order for the Deutscher Luft Hansa. This order was originally placed some time ago, but was subsequently withdrawn owing to certain objections on the part of the latter company to the types ordered. The withdrawal of this order, besides compelling the firm to go out of production, added considerably to their already existing financial difficulties, and the concern has since been in a bankrupt state.

The confirmation of this order from the Deutscher Luft Hansa, and the prospect of an early and successful settlement of the firm's financial affairs (reported to have been arranged by compulsory agreement), will no doubt be of considerable assistance to the firm in their efforts to regain their former position in the German aircraft industry.

(ii) *The Junkers Flugzeugwerke A.G., Dessau.*

In the spring of this year, the main Junkers Works (of which the Aircraft Manufacturing Company is a subsidiary) suspended payment and applied for a judicial composition with their creditors. Lack of working capital, and not bankruptcy in the usual sense of the term, made this step necessary.

According to a recent announcement in the German Press, a project is under consideration for a credit to the Junkers Works from the mining concern of Henschel & Sohn A.G., of Cassel, to be guaranteed by the State of Anhalt and the town of Dessau.

In the meantime, the Junkers Aircraft Works have reopened, after having been closed down for a short time, but with a very reduced staff.

THE GRAF ZEPPELIN.

The German Press reports that the first of the late summer flights of the Graf Zeppelin to Pernambuco, which were due to start on August 15th, has been postponed until further notice. Uncertain political conditions in South America have been given out as the reason for this decision, but it is hinted that the more correct explanation is that the cost of the earlier trips this year considerably exceeded receipts, and that this, coupled with the general depression, is the real reason for the decision to postpone the further flights.

CIVIL AVIATION IN THE U.S.S.R.

By the spring of 1932, 44,962 km. of air lines had been established in the U.S.S.R. Since 1931, the length of the lines has been increased 53 per cent. These lines are divided as follows:—

- 16,591 km. first-class lines.
- 12,830 km. second-class lines.
- 12,747 km. third-class lines.

In addition to these lines, the Deruluft (German-Russian) Company operates 2,794 km. of air routes.

At the present time, the plans for the establishment of new lines during 1932 provide for an extension of 4,822 km., including 1,890 km. to be operated by seaplanes. The lines to be established are as follows:—

First Class.—Moscow—Smolensk—Minsk and Penza—Saratov.

Second Class.—Moscow—Briansk—Chernigov—Kiev.

Baku—Krasnovodsk.

Novosibirsk—Barnaul—Semipalatinsk.

Kazan—Ufa—Magnitogorsk.

Krasnoyarsk—Yeneseisk—Turukhansk—Port Igarka.

At the end of 1932, the civil air services of the U.S.S.R. will be operating 49,784 km. of air lines, which will give Soviet Russia the second position in the world as regards civil aviation (after the U.S.A.). The main lines will be reorganized this year. Multiple-engined passenger aeroplanes and fast mail aeroplanes will be put into service. The most important lines:—

Moscow—Sverdlovsk—Novosibirsk—Irkutsk—Khabarovsk—
Vladivostok;

Moscow—Kharkov—Rostov—Baku—Tiflis;

Moscow—Kharkov—Dniepropetrovsk;

Moscow—Leningrad;

Moscow—Orenburg—Tashkent;

will become first-class airways, operated throughout the year by day and night.

The first Five Year Plan provided for the establishment of 45,893 km. of air lines. The Plan will be surpassed at the end of this year, and the total length of lines brought up to 49,784 km.

Civil aviation is just beginning its second Five Year Plan, which is to increase tenfold the results of the first Five Year Plan. (*Press.*)

JAPAN.

STANDARDIZATION OF PRODUCTION OF JAPANESE NAVAL AIRCRAFT.

PROPOSED AIRCRAFT ARSENAL AT YOKOSUKA.

With a view to standardizing production, and also to enable the Japanese naval authorities to carry out research and design in connection with naval aviation, it is proposed to form a special section in the Naval Arsenal at Yokosuka. The aircraft centre will work in conjunction with the Aeronautical Research Institute at Tokyo.

The present aircraft establishments at Hiro Naval Arsenal, and the Aeronautical Research Bureau at Kasumigaura will, it is stated, be removed to Yokosuka, under one control.

The Arsenal will be divided into eight bureaux: administration, aircraft, engines, armament and equipment, test, flight, scientific, medical and accountant.

It was hoped to start this new naval air establishment on April 1st, 1932.

PATRIOTIC AIRCRAFT.

The recent Sino-Japanese disturbances in Shanghai, in which the Japanese Naval and Military Air Service took a conspicuous part, have

stimulated the Japanese public into forwarding subscriptions by areas and prefectures to the Government for the purpose of providing "Patriotic Aircraft" for the Military Air Service.

The movement started in February last, and since that date twenty-eight Patriotic Aircraft have been delivered. It is hoped to present in all sixty-four aircraft.

The type of aircraft presented has in most cases been the 91 type "fighter," which will replace the "Nieuport," and the 88 type "light bomber and reconnaissance" aircraft, replacing the "Salmson" in the Army Air Service.

The aircraft are of Japanese manufacture, incorporating foreign designs and engines.

It is also stated by the Press that the Government favour the idea of the formation of a Patriotic Squadron, to be staffed by "star" airmen for the air defence of Tokyo.

The estimated prices of "subscription" aircraft is: fighter, £7,000; light bomber and reconnaissance, £8,000; heavy bomber, £20,000.

ITALY.

ATTEMPT ON THE AIR-SPEED RECORD.

The rumours which had been heard for some time to the effect that Italy was going to attempt to break the air-speed record culminated on June 15th and 16th, when Lieutenant Neri made two attempts on the record. On the first occasion he was compelled to alight again immediately after starting, and on the following day, when making another attempt, the Macchi seaplane was damaged. Since then no further news has been heard, and presumably the aircraft is being repaired.

AIR DISPLAY.

The second Italian Air Display (the first having been held in 1930) took place at the Littorio Aerodrome, Rome, on May 27th, 1932, and was on similar lines to the annual Royal Air Force Display at Hendon. The events included an aerobatic display by three squadrons, parachute descents, a glider demonstration, and, for the final event, the destruction of a petrol refinery, in which about 140 aircraft took part.

The Display was well organized and carried out, and provided evidence that the Italian Air Force has made marked progress in the two years which have elapsed since the last Display took place.

Extracts from the Foreign Press

EXTRACT FROM THE ITALIAN PRESS.

May, 1932.

AN AGELESS ARGUMENT.

MARIO FUCINI.

An article on air warfare by Luigi Bongiovanni, entitled " Bombing from the Sky," was published in the *Nuova Antologia* of February 16th, 1932. Certain debatable points arising from a perusal of this document are discussed in the present article.

The premises laid down in " Bombing from the Sky " are neither new nor exaggerated; the author tries to strike the balance between the usual exaggeration or neglect of the importance to future warfare of actions from the air.

Bombing from the air, its probable effectiveness and the most suitable means of defence against it are next discussed. General Bongiovanni considers that this problem is limited by two important factors: one is the question as to whether or not poison gas is to be used for attack, and the other which concerns the real possibilities of defence against an air offensive. It is difficult to see the importance of the first factor, as Bongiovanni himself declares that, although the different nations of the world have subscribed to a pact for non-aggression by poison gas, it would be very easy to get round this convention, and that therefore it cannot be considered as a serious pact. Fucini does not believe in the effectiveness of this pact, but if Bongiovanni does not believe in it either, how can he consider the question of the use or abolition of poison gas to be a principal factor in dealing with the problem of air defence?

Admitting, however, that for reasons of humanity, etc., poison gas were not used, would an air offensive be less serious?

It is Fucini's belief that poison gas would only be used occasionally by the air force, because the attacker has great difficulty in ascertaining the weather conditions prevailing over his objective, and the success or failure of the attack may depend on these conditions.

Fucini also explains that it is open to argument whether or not gas bombs are to be preferred to explosive and incendiary bombs. The two latter have the power *to destroy*, and if the moral effect of such destruction is taken into account, it is probable that the type of bomb able to effect it will be most used.

In any case, the type of bomb used does not seem to have much bearing on the problem of air defence.

Bongiovanni declares that a balance between offence and defence will be found in air warfare just as it was found for military and naval warfare. He also declares that this balance had been found by the end of the war. According to Fucini, this balance between offence and defence may be reached some day, but it was not reached in the last war, and probably will not be in the next, since all the progress made lies in the direction of air offensive, while the advance being made in defence is slow and uncertain.

Some of the arguments advanced by Bongiovanni are so weak and

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even contradictory that they claim the reader's attention. For example, on page 478, the author speaks of an air observation for defence, and says:

"Night bombing, during the last year of the war, came up against an unexpected and effective obstacle—apart from the complete darkening of targets, anti-aircraft guns and night fighters—in passive defence, in regard to which one of the most effective methods comprised air obstructions consisting of small captive balloons which could be sent up to a height of 3,000 metres, placed at intervals of 100 metres; the mooring cables, which were of steel and invisible at night, were a very serious danger to raiders. Italy led the way in this form of defence. Venice, Brindisi and Milan, which, up to the spring of 1918, had repeatedly been bombed from the air, were completely immune after the establishment of an organized system of defence."

Fucini states that he has never heard that an Austrian aeroplane was caught in an obstruction in the air, and does not think the Supreme Command would have kept silence over such welcome news. On the other hand, it was found that air obstructions were so costly in comparison with their effectiveness that they were abandoned, both then and for the future. In the present day, both in Italy and abroad, air obstructions have no place amongst the various subjects studied with regard to defence by night.

The writer holds the view that the Austrians gave up bombing Italian cities chiefly because the German Air Force, which had gone to their help in October, 1917, left the Italian front during the spring of 1918.

He does not believe, with General Bongiovanni, in the balance between air offence and defence, especially if due consideration is given to the other fronts where bombing from the air continued with such vigour as to become an ever-growing source of anxiety to the defenders, in spite of the abundance of defensive measures taken by the Allies against the common enemy—Germany. It should also be noted that as regards the air service Germany did not enter the war better equipped than her opponents, as she was in all other branches of warfare.

Unfortunately, a balance between air offensive and relative defence is still something remote, and it seems that an improvement in technique will continue to favour the offensive.

The problem of night fighting which is to the fore nowadays shows that anxiety is felt with regard to the question of defence against air raids, for, if air raids were to take place by night, as is most likely, the means of defence would be little better than they were during the last war, whereas means of offence have made considerable strides forward.

General Bongiovanni accepts the statement that "aviation can have a sinister influence on the internal life of a nation, on the mobilization of the army and navy, on communications, and on the *morale* of the population," but he does not consider it capable "as yet" of deciding the issue of a battle. Surely if one branch of warfare is admitted to have so much effect it can also be admitted to have a decisive influence?

Having admitted the *influence* of an independent air force on the result of a battle, Bongiovanni proceeds to his fundamental question, *i.e.*, What are the best means for defence against an air offensive?

He admits the disadvantage in which Italy is placed by her

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geographical position, and considers it a duty, even in times of peace, to provide for defence, "even if, by so doing, restrictions and sacrifices were placed on other armaments or other forms of defence."

Unfortunately, the need for such restrictions and sacrifices has *not* been felt. But we should like these words to be considered by all those who continue to talk of an *auxiliary* air force but yet will not understand the inevitability of the tremendous effect the independent air force will have on the next war.

Speaking of air defence, General Bongiovanni says: "Such defence will receive effective aid in bombardment against important enemy centres and also from the power derived from threatened bombardment, but it is clear that neither bombardment, threats of bombardment, nor the hypothetical *destruction of the opposing air force by means of battle from the air* will be of enough effect to avert the danger. The defence of the strategical points in the life of the nation must be thorough, both in the air and on the sea."

At this point we are inclined to ask what would remain to be done if the "*destruction of the opposing air force by means of battle from the air*" had taken place? Italian airmen would consider the *annihilation* of the opposing air fleet sufficient proof of victory.

Again, according to Bongiovanni, defensive measures should have priority over offensive measures in Italy, because of the vital necessity of keeping the powers of resistance, of battle and of victory of the Italian nation up to full strength, *i.e.*, of keeping up the strength of the army and navy.

We should here like to remark that our own observations concern a war in the immediate future, which implies a war waged with modern weapons. This question of modern weapons is a very important one, as at present one year in the history of aviation is equivalent to ten years in another service.

Within the past few years various new factors, such as blind flying and flying at a high altitude, have been introduced. Both these factors are of vast importance to Italy, because of the difficulties hitherto experienced in flight over the Appennines and the Alps, and which can now be obviated to a considerable extent. Bongiovanni does not seem to take these innovations into account, and, as he does not even mention them, it seems that he underestimates their importance.

Very important improvements were demonstrated during the manœuvres in August—September, 1931. One of these is the proved possibility for air units to move from one sector to another at a speed not even contemplated a short time ago. This, of course, means that the movements of air units are accelerated to such an extent that the same aeroplanes can be used in different sectors at short intervals.

Improvements in night flying have pointed the way to new possibilities for air offensive, and Fucini, who is firmly convinced that the effectiveness of fighters is greater than that of other machines, points out that, because of this fact, air raids are now almost impossible by day, and will be carried out quite successfully by night.

He shows, too, that indirectly the mass air manœuvres had their effect, for they evoked the moral factor: that is to say, they made the bulk of the population aware of air warfare.

The Italian people now know that defensive measures lie largely in

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the moral stamina of the nation, and that the air force can devote itself chiefly to offensive action instead of spending its time over defence.

Before the manoeuvres, the public had *no idea* what air warfare meant, and if a new war had broken out before that time the people would have been paralysed with terror at the absolutely *new* effects of air raids. Now they know what to expect, and they know, too, that, if they face with stoicism the fearful effects of enemy air raids, they will be enabling their own force to carry the war into the enemy's country. This stoicism may be their guarantee of resistance and so of offence.

How is it that Bongiovanni neglected an element of such importance as the moral force of the citizen, since the citizen stands for so much in the problem of air warfare?

Bongiovanni contradicts himself: he admits the importance of the independent air force by speaking of its "sinister" influence in war, and he says that Italy must take up a defensive attitude in order to maintain her powers of resistance, battle and victory, but he also says that the independent air force is extraneous to the maintenance of these powers.

He fears the action of an enemy air force, which is a sure sign that he attributes real value to offensive air actions. Why, then, does he uphold a defensive attitude?

He says: "In the present day, attack from the sky on objectives on land has a greater chance of success than measures of defence against such an attack," so how can he pronounce in favour of a defensive attitude, especially when he himself declares that Italy is placed by her geographical position in conditions which make defence difficult?

He admits that the effects of an air offensive may be of capital importance, so how can he advise defensive tactics? Surely the Italian Independent Air Force should be made strong enough not only for these essential defensive measures, but also for those offensive undertakings which can have a *sinister* effect on the enemy.

It seems that Bongiovanni came up against an idea containing elements of perfection to which he was oblivious. The idea is that: "Air warfare is imposing itself on all other forms of warfare. Italy had not an adequate independent air force, and one must be established, even if it is to the detriment of the other services. In this way Italy will be prepared for defence and, above all, equipped for offence."

Evidently Bongiovanni put a brake on his ideas and remained at the question of defence and of merely making allusions to the necessity of diverting funds from other budgets to the aviation budget.

General Bongiovanni's article shows other contradictions.

With regard to night flying, he says: "Such an efficient system of obstructions could be erected as to make the raider fly at a greater height and so render his aim uncertain. This could not occur, however, in a day raid, because an aeroplane can drop bombs accurately from a height greater than the height which can be reached by anti-aircraft guns. The only way, then, would be to use numbers of fighters." That being the case, however, in what would the improved measures of defence consist?

Fucini considers this talk of air raids *by day* absurd, as they are quite out of date, and the real question is one of defence against night raids.

Other debatable points:—

Bongiovanni calls the present Italian Air Force system an excellent one, but Fucini scoffs and says that in the event of sudden war it would be hopeless to find the air forces under various authorities, *i.e.*, Air Ministry, Ministry of Marine, War Office, Foreign Office, Voluntary (Fascist) Militia, and that it is essential to make it an independent service.

Fucini advocates the adoption of the French system, *i.e.*, the creation of a Supreme Command for Air Defence, comprising:

Air Defence (by means of fighting machines);

Anti-aircraft Defence (anti-aircraft guns and ground defences);

Anti-aircraft Protection (equipment for neutralizing the effect of raids by enemy aircraft).

Bongiovanni says that in the event of war there should be unity of command. Fucini declares it would be impossible to effect this unity at a moment's notice.

Bongiovanni says that land defence and air defence follow different lines. Fucini reiterates the futility of this idea, and says that there must be one command and one only, which will include war on land and war in the air, under the authority of the most important factor, *i.e.*, the air force.

With regard to fighting machines and artillery, Bongiovanni says that massed formations of aeroplanes cannot be wiped out by gun-fire unless they have first been engaged by enemy fighters, but that the moral effect on them is important and that at night effective barrages can be placed in the way of enemy fighters. Fucini points to an error here, as surely it must be easier for gun-fire to destroy aircraft in massed rather than in open formation.

According to Bongiovanni, four-fifths of the machines brought down were brought down by enemy fighters, and one-fifth by artillery fire. Surely this would be a good reason for artillery to become of secondary importance in an air defensive.

Apart from disagreement with Bongiovanni's statement, Fucini stresses the fact that in a future war air actions will be of supreme importance, and that there are as yet no adequate means of defence. The army and navy will play their parts, but the lead will be taken by the air force. Defence in the present day really lies in the spirit of the citizen, and a possibility of defence is chiefly psychological. If the citizen plays his part, the Italian Air Force will be able to open out and do its real work, which is offensive action against the strongholds of the enemy nation.

EXTRACT FROM THE SPANISH PRESS.

THE BALEARIC ISLANDS FROM THE MILITARY AND AVIATION POINT OF VIEW.

BY CAPTAIN PEDRO GARCIA ORCASITAS.

(*Revista de Aeronautica*, July, 1932.)

The Balearic Islands, on account of their position, are of great importance from the strategic point of view, and lend themselves more particularly to naval and air operations, especially the latter.

The Spanish air bases in the Western Mediterranean are Tetuan,

Mar Chica, Mar Menor (Los Alcazares and San Javier), Barcelona (sea-plane and landplane base), and Mahon. The aerodromes are Herraiz, Nador, Malaga, Motril, Granada, Almeria, Cieza, Hellin, Abbacete, Alicante, Valencia, Castellon and Figueras, and the naval bases, Cartagena and Mahon, of which only the former can undertake major repairs.

Only the Balearic Islands can command practically the whole of the Western Mediterranean. At present the only naval and air base is at Mahon, but Mallorca, Minorca, Ibiza, Formentera and Cabrera all possess bays suitable for use by seaplanes, and the two former have good harbours (Mahon, Palma, Pollenza, and Alcudia). Mallorca offers good landing facilities for aeroplanes, and an emergency landing-ground could be established in Minorca and some of the other islands.

The Sierra de Mallorca, a range of mountains about 1,000 metres high, and averaging 20 km. in width, runs along the north-west coast of Mallorca. From the meteorological point of view, flying conditions are good, as low cloud and strong winds are deflected by this range, which runs at right angles to the prevailing winds. Fog is very rare.

The north-western or Mallorca Range forms a natural defence for that side of the island; there is only a small port (Soller), which is now being improved by dredging, on this side, and the only means of access to this port, by land, are the road and railway to Palma, and the very bad road from Lluch to Pollensa.

Communications on the flat part of the country are good. There is a daily steamer service to Barcelona, and less frequent services to Valencia, Alicante, Castellon, Tarragona, Minorca, and the other islands. Pollensa is an intermediary alighting place on the French Aeropostal air line from Marseilles to Oran, and a service from Palma to Barcelona will probably be put into operation towards the end of this year.

Mallorca has adequate workshops for the maintenance of flying material. Water is difficult to obtain, a positive forest of windmills being required for pumping. There is, however, an adequate supply, and the island is self-supporting as regards agricultural produce, with the exception of a little wheat, which is imported.

Minorca is windswept, and only possesses the one safe harbour of Mahon for seaplanes, and even this is difficult to navigate. The ground is rocky and uneven, and the only places where it would be feasible to establish emergency landing-grounds are near Mercadal and Fornells. Temporary shelter can be obtained at Fornells and in some other bays, but in view of the nearness of Mallorca these are not of much importance.

These islands are a constant menace to the maritime communications of Great Britain, France and Italy, especially the two latter. On the other hand, they offer very little incentive to air attack, the only points worth striking at being the town of Palma, the naval base at Mahon, and the air base which is to be established in Mallorca. The other aerodromes would hardly be worth attacking, and the Sierra de Mallorca makes defence easy. Ibiza and Formentera are defence outposts for an attack from the south, and Minorca for one from the north.

The development of the Air Service has the effect of making Mallorca, rather than Minorca and Mahon, the most important point in the group. Whoever holds Mallorca can dominate Minorca by the air, but the defences of the latter would prove a valuable adjunct to the holder of Mallorca, though useless alone. It is, however, to be regretted that Mallorca is so poorly provided with defence works.

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Attacks on the Balearic Islands can only be made by sea or air. In both cases, night attacks are the more likely, and it is therefore important that searchlight and signals services, etc., should be well developed.

Of the three possible methods of attack by sea—blockade, bombardment, and the landing of forces—the first is unlikely to be adopted, on account of the natural resources of the islands; the danger of bombardment is not great, in view of the superiority of fixed batteries over ships' guns, and of the possibility of defence by air; and the landing of troops, which is always a difficult matter, can be rendered practically impossible by means of aircraft.

In Mallorca, if Inca is taken as the mobile defence centre, the island may most profitably be divided into three sectors, one of which should include Palma and the Sierra de Mallorca, the second Alcudia and Pollensa, and the third the South of the Island, with the town of Campos as its centre. This is the sector which offers the greatest facilities for disembarkation. Ground organization in Mallorca should include a central aerodrome, for use as an air base, between Inca and the Sierra,

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or within the triangle Inca—Sincu—Montuiri (out of range of naval action and difficult to attack by air), and aerodromes or auxiliary landing-grounds near Palma, La Puebla, Son Severa and Santany.

All possible alighting areas for seaplanes in the other islands should be noted, and all landing-grounds in Minorca, Ibiza and Formentera.

Attacks by air on the islands can only take the form of bombardment. Such attacks may be made either from floating bases or from very distant points (more than 350 km.). The distance to be covered is bound to detract a great deal from the effectiveness of the attack.

An adequate look-out service, for which all the islands would be utilized, is the first desideratum. Three semi-mobile anti-aircraft batteries should be provided for each of the three possible objectives—Palma, Mahon, and the air base.

At the naval and air bases and at Palma, protection balloons should be provided in order to supplement the action of the artillery and machine guns in certain directions.

Care must be taken to maintain communications—submarine cables, etc., between the islands.

The fighter units will constitute the chief air defence of the islands. The organization of the command should be the same as for a district on the mainland, which includes a certain stretch of coast. Anti-aircraft and air units must co-operate.

The following are the main points which must be borne in mind with regard to air armament:—

- (1) Requirements in view of the possibility of enemy air attacks, and their probable objectives.
 - (2) Possibilities of defence, with regard to available material and resources.
 - (3) Organization for joint action by all branches.
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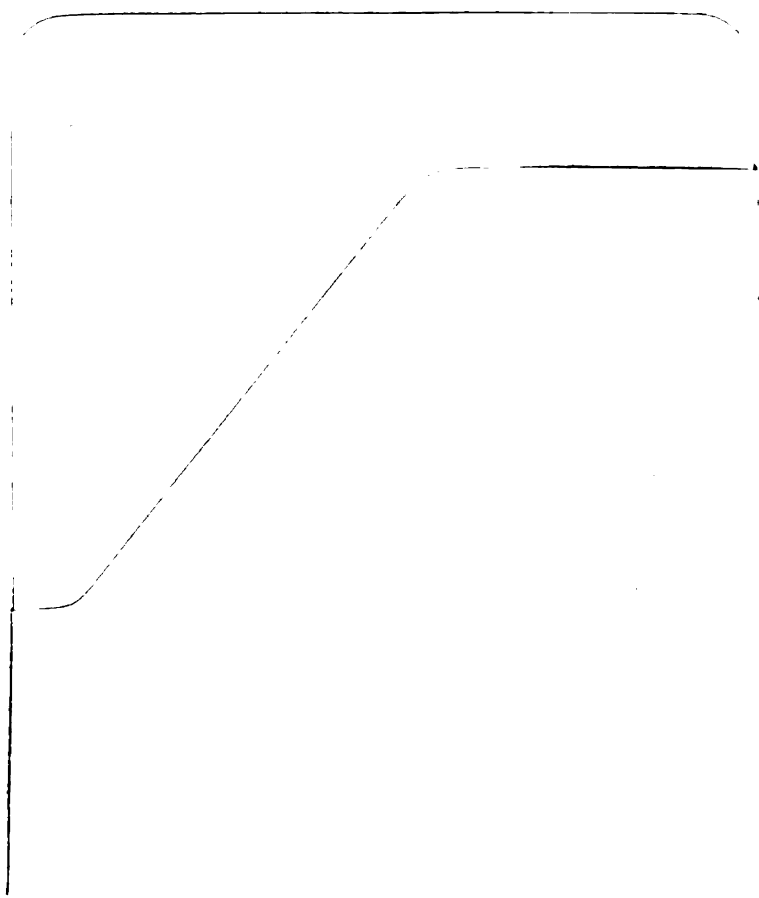
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